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The Montreal, Ottawa and Georgian Bay Canal

The Montreal, Ottawa and Georgian bay canal project, whether it be carried out by the British company which has undertaken its promotion, or by the Canadian government, which is being urged by interested parties in the Dominion to take it over, will rank as one of the most important engineering works of the world, and with the Suez and Panama canals in its beneficial effects upon the commerce of the nations. The Suez canal has proved of immense value to the passing from port to port of the overseas trade of the world, and the Panama canal will further benefit through business, but this great inland ship waterway—for it will be much more than a canal—will open up to the ships of the world the heart of a continent, great in a food producing capacity, great as a consuming center for the manufacturers of the older settled parts, and destined to develop still greater possibilities as time passes.

That there is nothing new under the sun, in regard to most things has been proven over and over again, and it is not so strange after all, that in regard to this project the route being followed is the oldest trading route to the center of the continent, and was followed—river stretch, portage, and tote-road, from time immemorial by the Indian tribes, ere ever French fur traders and missionary priests pushed their way in, or even the followers of Vikings under Lief the Lucky or other venturesome spirit, penetrated to beyond the headwaters of Lake Superior to the Red river valley. To go no further back than the period for which we have accurate history, it was in 1614, that Champlain ascended the Ottawa river to Mattawa, thence the Mattawa river to Trout lake, across the height of land and down Lake Nipissing and French river to the Georgian bay. This route was followed for nearly two centuries by the Hudson's Bay Co. and Northwest Trading Co. for the transportation of their supplies to the northwest, and in marketing their collections of furs, buffalo skins, etc., from that section. The first canal work on the Ottawa river was commenced in 1819, the Grenville canal being then undertaken and completed about 1835. Two years later the parliament of Upper Canada ordered the making of a survey to determine the practicability of navigation between Ottawa and Lake Huron. A masonry lock was constructed at Ste. Anne in 1840 to replace a wooden lock constructed some years previously by private enterprise. Work was started in 1852 on a canal and locks at the Chat's falls to connect Lake Deschesnes and Chats, but was abandoned upon the death of John Egan, through whose energy it had been started. In 1856, Walker Shanley was commissioned by the United Provinces of Upper and Lower Canada to make a survey of the proposed route to Georgian bay, but the work was never completed, owing to the appropriation becoming exhausted. His report was presented in 1858, and was generally favorable to the project, which was then for a 10-ft. navigation. T. C. Clarke was employed in 1859 to complete the surveys begun by Mr. Shanley, and his report set out that 352 miles of the 431 miles between Montreal and Lake Huron were naturally fit for a 12 ft. navigation; and of the 79 miles requiring improvement, only 29 miles of actual canal cutting was required, the total descent from summit level to Montreal being 64 ft.

In 1879, T. P. Bender reported on behalf of the Canadian Pacific railway in favor of a 14-ft. navigation of the French river and Lake Nipissing; T. C. Clarke made another report about 1899, favoring a 14-ft. navigation with locks for vessels 300 ft. in length and 45-ft. beam; A. F. Macleod reported to the Dominion government to the effect that the summit section, 21 miles, would cost $5,950,000; in 1899, C. R. Coubler Sr., made a further examination of the French river and Lake Nipissing for the Canadian Pacific railway, reporting in favor of a 20-ft. navgation, and in the following year, J. W. Fraser, in behalf of the department of public works, estimated the cost of providing a 20-ft. navigation from the Georgian bay to Lake Nipissing (North Bay, Ont.), at $4,200,000.

It was in 1894, that the Montreal, Ottawa and Georgian Bay Canal Co. secured its charter of incorporation for the construction of a continuous waterway from Montreal to the Georgian bay by way of the Ottawa river, Lake Nipissing and the French river. Four years later the charter was acquired by the New Dominion syndicate, a

London, Eng., organization, the moving power of which is the contracting firm of Walker & Co., members of which carried out the construction of the Manchester ship canal, the Barry docks and railway in Wales, the Buenos Ayres docks in the Argentine republic, as well as other great engineering works in various parts of the world. This company promoted the making of complete surveys, and maintained the charter, obtaining in 1906 the necessary power to increase its capital stock from $10,000,000 to $50,000,000, and its borrowing powers from $50,000,000 to $100,000,000, thus placing it, J. A. Marlcolm, manager and secretary, stated, in a position to obtain the capital necessary to proceed with construction, the company having in contemplation waterway suitable for navigation by steamships having a draught of 22 ft. By an act passed through the house of commons, Ottawa, at its current session the company has been granted an extension of time to 1910 to begin construction of its projected ship canal, and to 1916 for the completion of the works authorized. The special section inserted in the company's act of 1906, giving power to the government to incorporate the company's works at any time has been re-enacted, the time of which being extended from one to three weeks. The section provides for the payment to the company, in the event of expropriation, the value of the work actually done by the company up to the time of the giving of such notice, in surveying, and in the making of plans, and otherwise upon the ground, together with the value of all tangible property of the company of which possession may be so taken—such values to be fixed by three valuators, or the majority of them, one valuator to be chosen by his majesty, another by the company and the third by the two so chosen.

The reason for the inclusion of this section arose from the fact that the Dominion government has been urged by the maritime interests not to allow any private corporation to obtain control of so valuable a waterway as this will become. With the object of obtaining the most recent and accurate information on the subject the government in 1899-90 authorized surveys for a 14-ft. system and H. A. F. Macleod reported that the cost of such a channel would be $23,898,000, while the cost of a 20-ft. system would be $72,627,000. In Oct., 1904, the most exhaustive survey of the route ever undertaken was started, under the direction of the department of public works, A. St. Laurent being engineer in charge. The surveys were made by 13 parties, including one precise level party, and two boring parties. Work has been carried on almost continuously ever since, in connection with this survey, either in the field or in the office, and a final report is expected to be laid before parliament during the current session. The officers at present in charge of the project on behalf of the government are giving their consideration to the technical part and Mr. St. Laurent suggests the appointment of a mixed body of engineers and business men to consider the industrial, commercial and national aspects of the proposed undertaking. The plans in preparation by the department, which are yet only partially completed, are in full detail, and on a scale of 400 ft. to the inch. A smaller set of plans on a scale of 4,000 ft. to the inch as well as topographical maps, etc., are also in preparation. The areas covered in the working plans are: 1. Montreal to St. Anne, with an alternative route Bourt de L'Isle to Oka. 2. St. Anne to Hawkesbury . 3. Hawkesbury to Ottawa. 4. Ottawa to Chenaux rapids. 5. Chenaux rapids to Penbroke, with an alternative route Sable rapids to Fort William. 6. Penbroke to Des Joachims. 7. Des Joachims to Mattawa. 8. Mattawa to head of French river on Lake Nipissing. 9. Head of French river to Georgian Bay.

The projected water way will have a total length of not more than 440 miles, other estimates placing the mileage at 430, and 425, and the route was described in a recent debate in the house of commons, as follows: The French river is entered at Georgian bay and followed for 63 miles, arriving at Lake Nipissing; then across this lake to North bay, a distance of 19¼ miles. From North bay the shipway would ascend, cross over and descend the summit or height of land through a chain of lakes, arriving at Parreseux Falls, a distance of 24.50 miles to the town of Mattawa. At this point the Ottawa river is entered, passing Des Joachims rapids, where is entered and followed for 35 miles a magnificent stretch of open and uninterrupted natural channel, known as Deep river, then through the two Allumette lakes to Paquette's rapids, making a clear run from Des Joachims of 56 miles. If the Culbute channel is followed a saving in distance is effected of about seven miles. From Paquette the route follows Lake Coulonge, down the Rocher Fendu to Portage du Fort; then through Chats and Deschesnes lakes, the former 19.50 miles and the latter, 34 miles in length. Passing through Brewery creek and Hull there is a clear run of 50 miles to Hawkesbury, thence to Point Fortune and on through Lake of Two Mountains, 24 miles, arriving at Ste. Anne, making a total distance on the Ottawa river of 293.75 miles. Leaving Ste. Anne, the St. Lawrence river is entered and followed to Montreal, a distance of 24.50 miles. The reports prepared by the company's engineers, which were considered and reported upon by the late G. Y. Wisner, the United States authority on canal construction and allied subjects, give details showing the different water levels, and the number of locks necessary on the waterway. The water surface of Georgian bay at the ordinary stage is about 564 ft. above that of the St. Lawrence river at Montreal harbor. It is proposed to raise and maintain the level of Lake Nipissing at a level of 66 ft. above Georgian bay, making a total fall from summit level of the waterway to Montreal harbor, 630 ft. The total lockage from Georgian bay to Montreal will be 696 ft. less the amount of slope of the river between the locks, which is calculated to be between 40 and 50 ft., making the aggregate lifts of all the locks about 650 ft. It is proposed to take care of the 66 ft. rise from Georgian bay to Lake Nipissing with three locks so arranged in connection with regulating dams on the French river that the level of Lake Nipissing may be maintained at a little above its mean stage. French river is a series of deep narrow lakes separated by rapids at which points most of the fall from lake to bay is concentrated. The banks of the river are of gneiss and so high and steep that the levels of the different reaches may be regulated at almost any desired elevation without material damage to adjacent lands. Lake Nipissing will constitute a source of water supply for lockage through the French river, and through the summit level cut and the Mattawa river to the Ottawa river. The summit level will extend from lock No. 3 on the French river through Lake Nipissing, Trout lake, Talon lake and Paresseux chutes, a distance of 69 miles. The summit level will extend through a chain of lakes connected by short stretches of canal and will be maintained at nearly a constant level by regulating works at either end. From the upper lock of the Paresseux canal down the Mattawa river to its junction with the Ottawa river, a distance of 14.50 miles, there is a fall of 137 ft., which is to be

taken care of by five locks. From the confluence of the Mattawa and the Ottawa to Fort William, about 81 miles, the river is a series of deep, narrow lakes separated by rapids having an aggregate fall of 145 ft., which it is proposed to overcome by the construction of seven locks. The Mattawa and Ottawa above Fort William have high, steep banks, and can be regulated at such elevations of water surface that but little excavation will be needed except at the sites for locks and dams. From Fort William through the Culbute and Calumet channels to the head of Lake Des Chats, 56 miles, the river falls 115 ft. and requires five locks; from Lake Des Chats the river falls 55 ft. at Chats falls, requiring two locks, with which exception the river needs but little improvement between Cheneaux rapids and Des Chenes rapids, a distance of 47 miles. From Lake Des Chenes to the long reach of lever river below Ottawa there is a fall of 72 ft., requiring four locks. In the vicinity of and below Ottawa the existing water levels will not require to be materially changed, except to regulate the fluctuation of water levels so as to reduce the range between the high and low stages of the river. In the Grenville canal there is a fall of 41 ft. requiring three locks and in Carillon canal is a fall of 23 ft. to be overcome by one lock. At Ste. Annes a lock with a 3-ft. lift will be required, and in the Lachine canal three locks will have to be provided to lift the 45 ft. All of the structures for the entire route can be founded on rock in a most substantial manner, and the power necessary for operating locks, lighting and pumping can be generated at small expense at the respective sites.

It will be seen that the company's plans contemplate making Lake Nipissing the summit of the waterway, and cutting through the height of land at and near Talon lake one estimate being that a cutting 5 miles long and 50 ft. deep will be required. Several special surveys were made in 1905 and 1906 by the engineers of the public water department with a view of doing away with the necessity of this deep cut, by providing an additional water supply at a higher level. The area over which this survey was made extends from Lake Nipissing, through Trout, Turtle and Talon lakes, to the head of the Mattawa river. Several possible routes were examined, and every economical route closely surveyed to any condition of raised or lowered water surface in minute detail. A subsequent survey was made to deterimne the cost of diverting the Amable du Ford river by flumes or open cut to the head waters of Sparks creek, and thus obtain its discharge into Talon lake or summit level basin instead of discharging into the Mattawa river below Talon chute. This river has an average discharge of 700 cubic ft. per second and drains a larger area than that of Trout, Talon and Nasbousing lakes, which have an average discharge of 600 cubic ft. per second, a quantity deemed to be probably insufficient should the traffic on the waterway assume anything like large proportions.

It is claimed by the advocates of the route that the trade which will be attracted by the waterway will aggregate 20,000,000 tons a year, and that is the figure which has been used in the calculations made respecting the water supply at the summit. The figure is not too high a one when it is considered that at the Sault Ste. Marie canals the trade up and down runs to 50,000,000 a year, and that the territory tributary to the Great Lakes on the way of trade are yet far from being fully developed. The total distance from Fort William to Montreal by the proposed route is in round numbers 900 miles, against 1,296 miles by the present route, and it is claimed that the round trip could be made in average time of twelve days, allowing time for unloading and loading return cargo. On the present route via Lake Erie, the Welland canal and the St. Lawrence route it takes 21 days for the round trip—seven days each way and seven days delay.

The interim report of the department of public works recently presented to the house of commons has not yet been made public, but the information given in the house of commons during the recent discussion was to the effect that it covered the works necessary for the canalization of the French river, Lake Nipissing section. The estimated cost of the section is $13,700,589 which amount includes an expenditure of $1,493,361 for docks and the equipments at North bay. The estimates are based upon a 22-ft. waterway, so as to be amply safe for steamships of 21-ft. draught with a minimum width in channel of 250 ft. for canalled portions, and 300 ft. in open sections, and locks of sufficient capacity to accommodate vessels of 650 ft. in length, 60 ft. beam and 21 ft. draught. By the opening up of this section of the route a new port would be provided at North bay for the Canadian Pacific Ry. and at Callander on the Grand Trunk Ry. The harbor at Callander is described as being about a mile wide, and having a depth all over of 38 ft., and the harbor at French river is described as with the exception of Parry sound, perhaps the best on Georgian bay, is sheltered from gales and high winds, is easy of access for all craft and is perfectly safe for from five to six miles out in the bay.

Canals Through Canadian Territory

There are either under construction, survey or projected with or without parliamentary sanction half a dozen canals through Canadian territory having for their object the reduction of the distance to be traversed by vessels in their trips between upper and lower lake ports. The first of these is the 8 ft. Trent valley canal, upon which the Dominion government has already expended $5,500,000. The canal is projected from Trenton, on the Bay of Tuinte, Lake Ontario, to Georgian bay, at the mouth of the Severn river, about 210 miles, of which 150 miles are navigable lake and river stretches, and 65 miles canals and improved waterways; there will also be a branch to Lake Scugog, 27 miles, and a short branch from Lake Simcoe to Holland Landing. Contracts for the outlet to Lake Ontario, with one exception have been let, and the surveys are about completed for the Georgian bay outlet from Lake Simcoe along the Severn river. This canal, while it will do some through business will really be a local waterway and useful for the development of power for the towns and villages through which it passes. The waterway project under way—the Montreal, Ottawa and Georgian bay canal, is a much more ambitious affair as it contemplates providing a 22 ft. waterway from the St. Lawrence at Montreal to the mouth of the French river on Georgian bay. This follows the oldest trading route to

the head of the great lakes, and on its improvement there has already been expended by the Canadian and the imperial government nearly $7,000,000, including $500,000 upon the uncompleted and abandoned canal at Chats rapids, and $400,000 upon the abandoned lock and dam at Culbute.

Of the projects in different stages of development or abandonment, there have been plans for the construction of canals and ship railways between the Georgian bay and Lake Ontario at Toronto. Even so late as 1905, H. Spaulding, a New York engineer, sought power from the Ontario legislature to construct a combined canal and ship railway upon new principles from the Georgian bay, via Lake Simcoe, to two points on Lake Ontario, but the novelty of the plan was either too much for the legislators, or the plans were meager, as the whole thing fell through. Attempts have been made to revive an interest in the project through the township councils with but little success. From the point of view of United States marine interests the projects having for their object the shortening of the route between Lake Huron and Lake Erie are of the greatest importance. A very large proportion of the freight originating on the upper lakes is destined for the chain of ports extending from Toledo to Buffalo on the southern shore of Lake Erie. At the present time the whole of this traffic passes through the narrow and shallow channels of the Detroit and St. Clair rivers, upon the channels of which large sums of money are continually being spent to maintain them in a safe and efficient condition. From the southerly point of Lake Huron, near Sarnia, Ont., across to Lake Ontario, is about 50 miles, and while a canal has been projected over this route, it would necessitate the construction of swing bridges over six or seven lines of railway. Of the numerous schemes projected for a canal in this territory, the only live one today is that of the St. Clair and Erie Ship Canal Co. This company proposes to construct a canal, available for the largest lake steamers, about 13½ miles in length, on a straight course from the St. Clair flats canal and St. Clair lake to Lake Erie. It would be constructed through low lying land, with the underlying rock more than 20 ft. below the bottom of the deepest cut; it would have a uniform width of 72 ft. on the bottom and 156 ft. on the top, and would be without locks. Such a canal will effect a saving of 80 miles for vessels going from Cleveland, O., and ports eastward, to the upper lakes. This company is making application at the current session of the Dominion parliament for an extension of time within which it may commence work, its present charter powers expiring in May. Whatever its fate in parliament may be, the question whether construction will ever be undertaken will have to be decided by United States and not Canadian marine men.

NEW STEAMER FOR HOLLAND-AMERICA LINE.

A. Gips, general agent of the Holland-America Line of New York has received a cable from the home office at Rotterdam announcing the successful launching, on Saturday, Feb. 29, of the new twin-screw steamer Rotterdam from the yards of the well-known firm of ship builders, Harlan & Wolf, Belfast.

The new Rotterdam is a finely constructed vessel of the leviathan type, 668 ft. long, 77 ft. wide, 48 ft. deep, 17 knots speed, and will rank among the greatest trans-Atlantic liners of the present day. Her registered tonnage is 24,170, her displacement 37,190 tons, while she will offer accommodation for 505 first-class passengers, 520 second class, and 2,500 third-class passengers, a capacity exceeded by few, if any other steamers.

In the character of passenger accommodations, the new Rotterdam is a marked advance over any trans-Atlantic steamer afloat. The various social halls and saloons are of an unusually large size, and will be lavishly decorated and furnished in the highest styles of Dutch art by artists of repute.

In addition to dining rooms, music rooms, lounges, etc., she will have a splendid palm garden, fitted up with a cafe or tea room, reading rooms, writing rooms, libraries, two connecting smoking rooms, one opening directly upon a sheltered terrace, and more than 23,300 sq. ft. of promenade-deck space. There will be a number of the most luxuriously appointed cabin-de-luxe rooms with sitting rooms en suite, about 60 staterooms with private bath and toilet, and about 100 staterooms for the exclusive use of one passenger each.

Besides the improved features noted above, the steamer Rotterdam will be provided with every approved modern appliance for safety and convenience, including electric passenger elevators, watertight bulkheads, electric fire alarms, and fire subduing apparatus, deep sea telephones, telephone connection all over the ship, long distance wireless telegraph, safe deposit vaults for valuables, daily newspaper printed on board, and many other features of value and comfort.

The new Rotterdam will make her maiden trip from Rotterdam on June 13, and from New York on July 1.

IN MEMORY OF LIEUT. MAURY.

The United States government has taken the first step toward honoring the memory of the late Matthew Fontaine Maury, lieutenant and commander in the navy of the United States in charge of the naval observatory for many years. Senator James B. Frazier, of Tennessee, has introduced a bill into congress which asks for the joint co-operation of this nation and others in the erection of a magnificent memorial lighthouse to commemorate the work and achievements of this man. The bill calls for the creation of a commission to take up this subject with other nations and seeks to appropriate $50,000 to pay the expense of the commission and for preliminary surveys, designs and plans.

The bill states that Commander Maury developed the scope and work of the naval observatory to a high degree and by his scientific research and writings rendered invaluable service to and reflected the greatest credit upon this nation and upon the American navy, conferring lasting benefit upon the commerce of the world, and by his personal effort inaugurated and systematized hydrographic and geographic investigations, bringing together in pacific convention the nations of the earth, united in the common purpose of adopting a systematic plan for intelligent observation, report and study of meteorological conditions, laying the foundations for the establishment of a weather bureau and forecasting its work of "telegraphic forecasting" by land as well as on the sea, marking out the "steam lanes" for ocean lines as well as the paths for sailing vessels, on his "winds and currents charts," teaching in all languages of the civilized world the "physical geography of the sea" and finally bringing together in a closer bond and constant communication by oceanic cables the nations of the earth.

The bill is in response to the action of scientific bodies and scientists of other nations who believe that the eminent services of the late commander should be recognized by a memorial lighthouse to be maintained

jointly by the maritime powers of the world. The erection of such a monument by the joint effort of the nations would stand as a bulwark for peace among the nations of the earth. If the bill becomes a law the lighthouse will be located preferably within American waters at some point on or near the lines of the international commerce, and will be known as "the Maury memorial lighthouse."

President Roosevelt is authorized by the bill to appoint a commission of not more than five citizens to have charge of the construction of the lighthouse in conjunction with such commissioners as may be appointed by such nations as shall co-operate with this government. The commissioners are authorized to receive popular voluntary subscriptions from citizens of this and other nations to be used only in the construction of the memorial. The secretary of state is authorized to immediately acquaint foreign powers with the action of this government and request the co-operation of the diplomatic and consular representatives of this government with the commission in presenting this matter to the powers to whom they are respectively accredited.

The secretary of the navy and the secretary of the treasury are asked to render whatever assistance they can through the lighthouse board and the geodetic and coast survey in making preliminary surveys in determining a suitable location and in furnishing plans, specifications and estimates of construction.

Com. Maury was born Jan. 14, 1806, in Spottsylvania county, Va., and died in Lexington, Va., Feb. 1, 1873. He entered the United States navy at the age of 19 years and went to France on the frigate Brandywine with General Lafayette. On his return he published "Maury's Navigation" which was adopted as a text book in the navy in 1839. While on his way from Tennessee to New York the stage coach in which he was traveling was overturned and he was crippled and disabled for further active service. He was the author of "Physical Geography of the Sea" which made him famous throughout Europe. He became superintendent of the naval observatory in 1844 and given the rank of commander in 1855 which he held at the outbreak of the civil war. In 1861 he resigned to follow his native state, Virginia, out of the union; in 1868 he became professor of physics in the military institute at Lexington Va. He was the author of the "Maury Wind and Current Charts," and of two large volumes of sailing directions. He ranked with the best scientists of the day and almost every nation in Europe conferred upon him orders of knighthood and other insignias of honor.

RICHARDSON & CO.'S APPOINTMENTS.

Capt. W. C. Richardson has made the following appointments for the vessels of his fleet:

STEAMER.	CAPTAIN.
Howard M. Hanna, Jr.	Thomas Wilford
David Z. Norton	John H. Babbitt
W. C. Richardson	E. J. Burke
Samuel Mitchell	Wm. Hagan
J. H. Wade	C. W. Willett
Roumania	B. R. Walker
Wm. Edwards	J. E. Stover
STEAMER.	**ENGINEER.**
Howard M. Hanna, Jr.	James Falconer
David Z. Norton	A. C. Bowen
W. C. Richardson	James Bennett
Samuel Mitchell	Oscar Anderson
J. H. Wade	Henry Landers
Roumania	A. J. Schryver
Wm. Edwards	Moses Blondin
BARGE.	**CAPTAIN.**
Chickamauga	H. W. Phillips
Crete	George Mackie
Golden Age	Walter Stalker

VESSEL TONNAGE OF THE UNITED KINGDOM.

The total addition of steam tonnage during the year has been 1,249,515 tons gross; and, of sailing tonnage, 28,599 tons gross; or, in all, 1,278,114 tons gross.

Of the tonnage added to the register over 95 per cent consists of new vessels, nearly all built in the United Kingdom. The largest items among the other additions to the register are those of vessels transferred from foreign countries and from British colonies to the United Kingdom. These together amount to 47,169 tons.

The gross deduction of steam tonnage from the register amounts to 531,812 tons; and, of sailing tonnage, to 128,432 tons; or, in all, to 660,244 tons. Of the steam tonnage, 34 per cent, and 44 per cent of the sailing tonnage, included in these figures, have been removed on account of loss, breaking up, dismantling, etc. It should be noted that in the returns of the registrar-general of shipping (from which the following tables are compiled) wrecks, etc., are included according to the months in which they were respectively reported to him, and not, as in Lloyds register wreck returns, according to the dates at which they occurred.

The tonnage transferred to foreigners during 1907 amounts to 350,474 tons. The steam tonnage deducted on this account is 282,058 tons, and the sailing tonnage 68,416 tons, or over 53 per cent and nearly 53.3 per cent, respectively, of the gross deductions in each case. The total is 78,243 tons lower than the similar figures for the last year. The returns show that 58,975 tons have been transferred to Italy, and 54,711 tons to Norway, within the year under review. Among other countries which have acquired a considerable amount of tonnage from the United Kingdom may be mentioned Greece (43,879 tons), Russia (30,494 tons), France (25,786 tons), and Sweden (21,014 tons). In the main, the vessels which are transferred to foreigners are not of very recent construction. Tables which are included in the registrar-general's returns indicate that nearly 12 per cent of the tonnage removed from the register because of foreign transfer was built before 1880; 31 per cent before 1885; 51 per cent before 1890; over 67 per cent before 1895; 78 per cent before 1900; and about 90 per cent before 1905. In addition to the tonnage transferred to foreigners, 65,841 tons have been transferred to British colonies during 1907, as compared with 59,208 tons in 1906, 52,464 tons in 1905, and 37,464 tons in 1904. It will be understood that new vessels built in the United Kingdom directly for colonial and foreign owners are not included in these returns.

On the whole, during 1907, the steamers on the official register of the United Kingdom have increased by 493 vessels, and 717,703 tons, while sailing vessels have decreased by 197 vessels, and 99,833 tons.

The total number of vessels on the register has, therefore, increased by 296, and the total tonnage by 617,870 tons during the year.

The following comparison of the figures for 1907 with those for the previous nine years will be of interest:

ADDITIONS TO THE REGISTER OF THE UNITED KINGDOM.—STEAM.

	New Vessels.		Bought From Abroad.		Transferred From Colonies.		Other Additions.		Total.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
1898	646	1,011,233	44	62,307	13	30,746	26	7,482	729	1,111,768
1899	628	1,166,706	45	58,094	6	12,760	33	5,032	712	1,242,592
1900	632	1,124,471	28	39,442	9	17,466	34	5,251	703	1,186,630
1901	573	1,126,263	33	30,141	4	7,522	33	9,464	643	1,173,390
1902	588	1,121,013	38	43,815	8	22,949	29	4,612	663	1,192,389
1903	617	951,185	28	37,222	5	13,455	23	6,894	673	1,008,756
1904	585	1,023,333	20	40,590	6	14,237	32	1,988	643	1,080,148
1905	624	1,209,665	22	13,138	2	832	32	3,229	680	1,226,864
1906	778	1,431,749	48	58,628	4	1,021	30	1,722	860	1,493,120
1907	838	1,199,524	28	28,043	7	14,577	45	7,371	918	1,249,515

REMOVALS FROM THE REGISTER OF THE UNITED KINGDOM.—STEAM.

	Lost, Broken Up, Etc.		Sold Foreign		Transferred To Colonies.		Other Deductions.		Total.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
1898	195	227,142	260	434,725	19	33,149	10	1,644	484	696,660
1899	158	196,690	338	505,711	16	19,474	6	315	518	722,190
1900	188	191,822	300	491,131	22	57,400	14	1,507	524	741,860
1901	143	154,261	181	278,182	32	54,090	8	1,896	364	488,429
1902	133	134,400	176	240,390	18	28,761	12	1,090	339	404,641
1903	167	198,397	149	250,436	32	59,378	6	437	354	508,648
1904	163	192,786	203	276,059	24	34,321	4	1,062	394	504,228
1905	201	178,769	264	422,395	31	50,901	21	48,442	517	700,507
1906	178	181,013	266	347,529	29	57,248	4	2,823	477	588,613
1907	148	180,883	235	282,058	31	64,241	11	4,630	425	531,812

ADDITIONS TO THE REGISTER OF THE UNITED KINGDOM.—SAIL.

	New Vessels.		Bought From Abroad.		Transferred From Colonies.		Other Additions.		Total.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
1898	242	18,067	16	2,257	2	2,610	90	6,119	350	29,053
1899	228	19,292	29	7,875	2	2,240	66	3,701	325	33,108
1900	213	18,007	24	8,713	3	2,435	84	5,748	324	34,903
1901	217	31,310	29	8,625	3	2,636	52	2,632	301	45,203
1902	214	34,628	29	7,587	6	10,739	76	4,166	325	57,120
1903	219	24,832	11	1,905	2	2,504	83	5,354	315	34,595
1904	221	25,142	17	2,718	4	2,930	65	3,465	307	34,255
1905	170	15.414	9	1,514	2	1,011	105	5,212	286	23,151
1906	148	14,871	11	1,479	1	1,980	72	5,074	232	23,404
1907	168	15,567	15	4,224	3	325	101	8,483	287	28,599

REMOVALS FROM THE REGISTER OF THE UNITED KINGDOM.—SAIL.

	Lost, Broken Up, Etc.		Sold Foreign		Transferred To Colonies.		Other Deductions.		Total.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
1898	448	75,304	220	153,783	6	4,136	20	1,645	694	234,868
1899	413	65,266	266	103,878	7	2,207	28	2,294	714	173,645
1900	413	74,115	246	105,009	9	9,927	45	4,144	713	193,195
1901	325	84,015	148	68,565	7	5,206	23	1,333	503	159,119
1902	322	55,240	95	40,787	7	3,842	24	1,645	448	101,514
1903	318	63,469	88	50,038	3	3,529	19	738	428	117,774
1904	318	55,066	85	47,116	5	3,143	20	1,097	428	106,422
1905	269	69,701	135	90,306	7	1,563	26	2,441	437	164,011
1906	296	59,891	112	81,188	5	1,960	21	1,316	434	144,355
1907	322	56,887	120	68,416	6	1,600	36	1,529	484	128,432

NET ADDITIONS OR REMOVALS.

	Steam.		Sail.		Total.	
	No.	Tons.	No.	Tons.	No.	Tons.
1898	+245	+415,108	—344	—205,815	— 99	+209,293
1899	+194	+520,402	—389	—140,537	—195	+379,865
1900	+179	+444,770	—389	—158,292	—210	+286,478
1901	+279	+684,961	—202	—113,916	+ 77	+571,045
1902	+324	+787,748	—123	— 44,394	+201	+743,354
1903	+319	+500,108	—113	— 83,179	+206	+416,929
1904	+249	+575,920	—121	— 72,167	+128	+503,753
1905	+163	+526,357	—151	—140,860	+ 12	+385,497
1906	+383	+904,507	—202	—120,951	+181	+783,556
1907	+493	+717,703	—197	— 99,833	+296	+617,870

It may be added that the vessels on the register of the United Kingdom on Dec. 31, 1907, were approximately as follows:

Steam, 11,400 vessels of 16,501,427 tons gross.
Sailing, 9,660 vessels of 1,575,379 tons gross.

Total, 21,060 vessels of 18,076,806 tons gross.

NEW VESSELS CLASSED BY LLOYDS REGISTER DURING 1907.

During 1907, 780 new vessels of 1,379,534 tons, have been classed by Lloyds register. Corresponding with the general movement of the ship building industry the present returns shows a decrease of 114,433 tons, as compared with the similar figures for 1906, which were the highest on record. Of these vessels, 733 of 1,367,968 tons are steamers, and 47 of 11,566 tons are sailing vessels.

With the exception of one iron steamer of 446 tons and 34 wood vessels of about 3,500 tons, the material used in the construction of the whole of the tonnage classed was steel.

Sailing tonnage, which formed 25 per cent of the total tonnage classed in 1891, 30 per cent in 1892, only between 1 and 2 per cent in each of the years 1899 to 1901, 5.7 per cent in 1902, 4.1 per cent in 1903, 1.3 per cent in 1904, 0.73 per cent in 1905, and only 0.46 per cent in 1906, was 0.84 per cent of the total classed in 1907.

Among the vessels classed during the year, were many of special types designed to meet the requirements of particular trades, including a number of vessels fitted with steam turbines.

The average size of the steamers classed during the past year is about 1,866 tons, and of sailing vessels about 246 tons. Excluding vessels under 200 tons, in order to avoid the diminution caused by yachts, fishing vessels, etc., the comparative averages for the past few years stand as follows: See table A, page 19.

During 1907, eight steamers of over 7,000 tons each have been classed, as compared with seventeen in 1900, nine in 1901, twenty-three in 1902, twenty-one in 1903, fifteen in 1904, fourteen in 1905, and twelve in 1906. The largest steamers classed were the two big Cunard steamships Mauretania, 31,938 tons, and Lusitania, 30,822; Heliopolis, 10,897 tons; Arawa, 9,372 tons; and Iroquois, 9,202 tons. Three sailing vessels of over 1,000 tons have been classed during 1907.

Of the tonnage classed during the year, 1,215,535 tons, or over 88 per cent, have been built in the United Kingdom. Among foreign countries, Germany, Holland, United States of America, and Denmark have contributed the largest amount of tonnage.

The return includes a statement showing the countries for which the vessels that have been classed were built; 902,595 tons, or 65.4 per cent, have been built for the United Kingdom, and 476,939 tons, or 34.6 per cent, for other countries. Among the latter, Austria-Hungary leads with 81,605 tons; Germany has 79,132 tons; Denmark, 41,401 tons; Norway, 39,654 tons; Italy, 36,510 tons; and the British colonies, 30,848 tons.

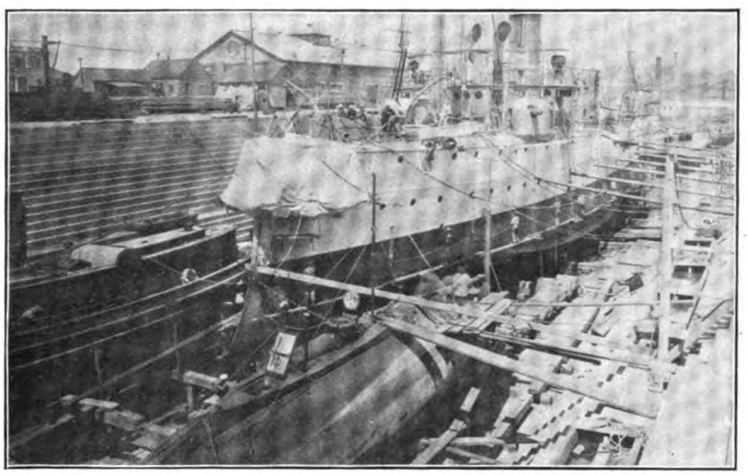
The tug building for the Great Lakes Towing Co. at Chicago will be named in honor of L. C. Sabin, superintendent of the Sault Ste. Marie canal. This new tug, which will be launched in a few days, will be stationed at the Sault.

TABLE "A."

	1907.	1906.	1905.	1904.	1903.	1902.	1901.	1900.	1899.	1898.	1897.
Steam	2,411	2,417	2,540	2,428	2,452	2,733	2,906	2,706	2,807	2,634	2,452
Sail	918	640	1,437	805	1,518	2,018	2,551	1,580	1,612	1,441	1,741

GUNBOAT BENNINGTON.

The accompanying photograph shows the gunboat Bennington in dry dock at the Mare Island naval station with the submarine torpedo boat Grampus in the foreground. The government is at present engaged in the construction of a second dry dock at th Mare Island navy yard to be 754 ft. long, 100 ft. wide. Its cost will approximate $2,000,000 and it is expected that it will be completed two years hence.



DRY DOCK AT MARE ISLAND NAVY YAR D WITH GUNBOAT BENNINGTON IN DOCK.

OUR LARGE TRANS-ISTHMIAN COMMERCE.

BY WALTER J. BALLARD.

American products and manufactures, exceeding $40,000,000 in value, crossed the Isthmuses of Panama and Tehuantepec in 1907. This was more than three times as much merchandise originating under the American flag as entered into trans-isthmian commerce generally in any earlier year, reports the bureau of statistics, of the department of commerce and labor.

This sudden and large increase in American commerce in American goods each way was rendered possible by the opening of the Mexican-Tehuantepec railway in January, 1907. The railway is only 190 miles long, and the termini are Coatzacoalcos on the Gulf of Mexico and Salina Cruz on the Pacific. Regular steamship lines now run from Coatzacoalcos to Philadelphia and New York, and from Salina Cruz to Pacific coast ports and to Hawaii. Various lines connected with foreign countries also touch at the eastern and western termini.

American goods are going from eastern to western American ports across the Isthmus of Tehuantepec at the rate of about $14,000,000 a year, while the sugar of Hawaii comes this way instead of by the now abandoned "around-the-Horn" route. These shipments amounted in value to $15,500,000 in 1907. The total east and west commerce in 1907 was $29,500,000.

Also in 1907 the Panama isthmian route materially increased its business by the use of its "across-the-isthmus" railway—now the property of the United States. American goods to the value of between $12,000,000 to $15,000,000 were shipped over that railway in 1907, destined for American ports, east and west, and for foreign countries. Shipments from New York via Panama went to the cities of San Francisco, Los Angeles, San Diego, Santa Barbara, Oakland, Portland, Seattle and Spokane, and to Chile, Peru, Ecuador, Bolivia, Panama, Costa Rica, Honduras, Nicaragua, Guatemala, Mexico and British Columbia. These amounted to about $13,000,000 while nearly $2,000,000 worth of western American products came east over the Panama railway. New York sent west, via Panama, all classes of merchandise, but more especially meats, flour, cotton goods, mineral oil, mining machinery, iron and steel manufactures and miscellaneous manufactures. San Francisco sent east, via Panama, to Tampa, Philadelphia, New York, New Haven and Boston, wines, pig lead, quicksilver, hides and skins and miscellaneous merchandise.

The distance between New York and San Francisco direct by land is 3,191 miles; via Tehuantepec, 4,415 miles; via Panama, 5,305 miles; and via Magellan Straits, 13,089 miles. From New York to Port Townsend, Wash., direct, is 3,199 miles, and via Tehuantepec, 5,190 miles, and via Panama, 6,080 miles, and via Magellan Straits, 13,848 miles. From New York to Honolulu, direct, via San Francisco, is 5,288 miles, and via Port Townsend, 5,569 miles, via Tehuantepec, 5,806 miles, and via Panama, 6,686 miles; and via Magellan Straits, 13,269 miles.

All merchandise originating in or leaving any port of the United States and crossing Mexico by the Tehuantepec line, is sent across the isthmus in sealed cars and is readmitted free of duty on reaching any other port of the United States. Both Mexico and the United States maintain a force at either end of this route to prevent illicit entries.

CAPT. MAHAN'S NEW BOOK.

Capt. Alfred T. Mahan, who has gained world-wide distinction as an authority on naval affairs, has recently issued a book through the Harper entitled "From Sail to Steam." The source and title of this work might lead one to believe that its character was technical. On the contrary it is a wonderfully illuminating narrative full of personal reminiscences, filled with an intimate appreciation of the potentiality of the change in the evolution from sail to steam, and especially readable for the well-informed layman. The preface Capt. Mahan devotes to himself, under the title "Introducing Myself," making one of the most interesting chapters in the book. The price of the book is $2.25 and may be had from the MARINE REVIEW.

MORSE SIGNALING LAMP.

Frank Watkins, 1322 River avenue N. W., Cleveland, is the sole agent in the United States for the Morse signaling lamp, manufactured by J. W Ray & Co., Liverpool. The chief merits claimed for this lamp are: That the lamp is placed clear of deck and hull lights, is operated by the officer on the bridge, the ordinary Morse key being used to give the long and short flashes. The practice of tapping educates the ear also as in the ordinary telegraph system. At short distances the lamp can be used in daylight. In fact the White Star line ships communicate with the office while lying in the Mersey.

The Lake Erie Dry Dock & Mill Co., Sandusky, O., is building a tug 68 ft. over all and 15 ft. beam for the Kishman Fish Co. The tug will be named Joseph T. Sloat.

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INLAND WATERWAYS COMMISSION.

The preliminary report of the Inland Waterways Commission has been transmitted to congress by President Roosevelt accompanied by the usual lucid and vigorous remarks from the president himself. It is clear that President Roosevelt has given the subject of internal waterways much consideration. He says that our river systems are better adapted to the needs of the people than those of any other country. In extent, distribution, navigability, and ease of use, they stand first. Yet the rivers of no other civilized country are so poorly developed and little used, or play so small a part in the industrial life of the nation, as those of the United States. In view of the use made of rivers elsewhere the failure to use our own is astonishing and no thoughtful man can believe that it will last.

The commission finds that it was unregulated railroad competition which prevented or destroyed the development of commerce on our inland waterways. The Mississippi is a case in point. The report shows that commerce was driven from the Mississippi by the railroads. While production was limited the railways with their convenient terminals gave quicker and more satisfactory service than the waterways. Later they prevented the restoration of river traffic by keeping down their rates along the rivers, recouping themselves by higher charges elsewhere. The president says that throughout the country the railways have secured such control of canals and steamboat lines that today inland waterway transportation is largely in their hands. This was natural and doubtless inevitable under the circumstances, but it should not be allowed to continue unless under careful government regulation. Continuing the president says:

"Comparatively little inland freight is carried by boat which is not carried a part of its journey by rail also. As the report shows, the successful development and use of our interstate waterways will require intelligent regulation of the relations between rail and water traffic. When this is done the railways and waterways will assist instead of injuring each other. Both will benefit, but the chief benefit will accrue to the people in general through quicker and cheaper transportation.

"The report rests throughout on the fundamental conception that every waterway should be made to serve the people as largely and in as many different ways as possible. It is poor business to develop a river for navigation in such a way as to prevent its use for power, when by a little foresight it could be made to serve both purposes. We cannot afford needlessly to sacrifice power to irrigation, or irrigation to domestic water supply, when by taking thought we may have all three. Every stream should be used to the utmost. No stream can be so used unless such use is planned for in advance. When such plans are made we shall find that instead of interfering, one use can often be made to assist another. Each river system, from its headquarters in the forest to its mouth on the coast, is a single unit and should be treated as such. Navigation of the lower reaches of a stream cannot be fully developed without the control of floods and low waters by storage and drainage. Navigable channels are directly concerned with the protection of source waters and with soil erosion, which takes the materials for bars and shoals from the richest portions of our farms. The uses of a stream for domestic and municipal water supply, for power, and in many cases for irrigation, must also be taken into full account.

"The development of our inland waterways will have results far beyond the immediate gain to commerce. Deep channels along he Atlantic and Gulf coasts and from the Gulf to the great lakes will have high value for the national defense. The use of water power will measurably relieve the drain upon our diminishing supplies of coal, and transportation by water instead of rail only will tend to conserve our iron. Forest protection, without which river improvement cannot be permanent, will at the same time help to postpone the threatened timber famine, and will secure us against a total dearth of timber by providing for the perpetuation of the remaining woodlands. Irrigation will create the means of livelihood for millions of people, and supplies of pure water will powerfully promote the public health. If the policy of waterway improvement here recommended is carried out, it will affect for good every citizen of the republic. The national government must play the leading part in securing the largest possible use of our waterways; other agencies can assist and should assist, but the work is essentially national in its scope.

"The various uses of waterways are now dealt with by bureaus scattered through four federal departments. At present, therefore, it is not possible to deal with a river system as a sin-

gle problem. But the commission here recommends a policy under which all the commercial and industrial uses of the waterways may be developed at the same time. To that end, congress should provide some administrative machinery for co-ordinating the work of the various departments so far as it relates to waterways. Otherwise there will not only be delay, but the people as a whole will fail to get from our streams the benefits to which they are justly entitled.

"The commission recognizes that the cost of improving our inland waterways will be large, but far less than would be required to relieve the congestion of traffic by railway extension. The benefits of such improvement will be large also, and they will touch the daily life of our people at every point, uniting the interests of all the states and sections of our country. The cost and benefits should be equitably distributed, by co-operation with the states and the communities, corporations, and individuals beneficially affected. I heartily concur in the commission's recommendation to this end. Such co-operation should result in united effort in carrying out the great duty of improving our inland waterways. While we delay our rivers remain unused, our traffic is periodically congested, and the material wealth and natural resources of the country related to waterways are being steadily absorbed by great monopolies."

That the president well understands the errors in our policy of waterway development is clearly proved in the following paragraphs which touch upon points that have impressed many men that have had anything to do with the development of waterways, especially the rivers. He says:

"Hitherto our national policy of inland waterway development has been largely negative. No single agency has been responsible under the congress for making the best use of our rivers, or for exercising foresight in their development. In the absence of a comprehensive plan, the only safe policy was one of repression and procrastination. Frequent changes of plan and piecemeal execution of projects have still further hampered improvement. A channel is no deeper than its shallowest reach, and to improve a river short of the point of effective navigability is a sheer waste of all it costs. In spite of large appropriations for their improvement, our rivers are less serviceable for interstate commerce today than they were half a century ago and in spite of the vast increase in our population and commerce they are on the whole less used.

"The first condition of successful development of our waterways is a definite and progressive policy. The second is a concrete general plan, prepared by the best experts available, covering every use to which our streams can be put. We shall not succeed until the responsibility for administering the policy and executing and extending the plan is definitely laid on one man or group of men who can be held accountable. Every portion of the general plan should consider and so far as practicable secure to the people the use of water for power, irrigation, and domestic supply as well as for navigation. No project should be begun until the funds necessary to complete it promptly are provided, and no plan once under way should be changed except for grave reasons. Work once begun should be prosecuted steadily and vigorously to completion. We must make sure that projects are not undertaken except for sound business reasons, and that the best modern business methods are applied in executing them. The decision to undertake any project should rest on actual need ascertained by investigation and judgment of experts and on its relation to great river systems or to the general plan, and never on mere clamor.

"The improvement of our inland waterways can and should be made to pay for itself so far as practicable from the incidental proceeds from water power and other uses. Navigation should of course be free. But the greatest return will come from the increased commerce, growth, and prosperity of our people. For this we have already waited too long. Adequate funds should be provided, by bond issue, if necessary, and the work should be delayed no longer. The development of our waterways and the conservation of our forests are the two most pressing physical needs of the country. They are independent, and they should be met vigorously, together, and at once. The questions of organization, powers, and appropriations are now before the congress. There is urgent need for prompt and decisive action."

The report of the commission is very complete. It says that the possibilities of inland navigation are indicated by the fact that there are in mainland United States some 25,000 miles of navigable rivers and at least an equal amount which are navigable or might be made so by improvement; there are also some 2,500 miles of navigable canals and over 2,500 miles of sounds, bays and bayous readily connectable by canals aggregating less than 1,000 miles in length to form inner passages paralleling the Atlantic and Gulf coasts—these being additional to some thousands of miles (reckoned between leading ports) of regularly navigated waters in lakes and land-locked bays. The commission says that while precise figures are not now obtainable it is safe to say that the current value of our inland transportation facilities (of which railways form all but a small percentage) exceeds one-eighth of our national wealth; yet these facilities are so far inadequate that production is impaired and the growth of the country is retarded.

AROUND THE GREAT LAKES.

The new steamer building for Harvey L. Brown of Buffalo will be named for Wm. H. Truesdale of New York, president of the Lackawanna Railroad. She will be operated by the Empire Steamship Co.

Bids are now being solicited for the widening of the canal above the locks at Sault Ste. Marie. Bids were submitted for the work two years ago but actual construction was held up through litigation involving the right of private ownership in the rapids.

The navy department has decided to send two submarines to the Pacific coast on board a naval collier. The submarines selected for the purpose are the Porpoise and the Shark, which are now at the New York navy yard. It is probable that the collier Caesar will be chosen to transport them to San Francisco, but it has not been decided how the submarines are to be carried. They weigh about 60 tons each and may be carried on deck, or it may be decided to remove several deck beams from the collier and lower them into the hold.

Apparently there is no rest for the Badger State. She has again been sold, this time to the Reeves & McBean Lumber Co. of Detroit by H. N. Loud, Au Sable, Mich. to operate in the lumber trade. The Badger State was once a line boat operating in the service of the Western Transportation Co. She was later purchased by Barry Brothers and operated in Lake Michigan. For a brief period they operated her between Cleveland and Detroit on Lake Erie. She was later fitted up as a floating pool room and anchored above Belle Isle, Detroit.

THE PRESENT AND FUTURE OF SUBMARINE NAVIGATION.*

BY A. M. LAUBEUF, ANCIEN INGENIEUREN-CHEF DE LA MARINE, FRANCE.

Submarines have commenced to count as engines of war for the last twelve years only, the first boats of the kind being the Gustave-Zede, Morse, and Narval, in France, and the Holland class in the United States. The rapid progress made in their construction and navigation, the future which opens before them, and the hopes that are placed on their services, have drawn general attention to this new branch of naval architecture, and have raised besides heated discussions among experts.

From the very commencement, contrary opinions were freely expressed in the matter of submarines. Naval men in favor of large battleships have stated that no use would be found for the new type of boat, adding that it was, at best, nothing but an interesting toy; while the champions of submarine navigation have, for their part, exaggerated to the same degree in the opposite direction. In 1800 Fulton asserted that submarines would ensure the liberty of the sea; and Bauer, another advocate of the same type of craft, prophesied the disappearance of battleships, and the advent of submarine boats.

My opinion is that in *medio stat virtus,* the submarine boat cannot do everything and cannot solve all problems. It cannot control the high seas and navigate up and down the oceans. Such a belief is manifestly an overestimation. If the submarine as now built be increased in tonnage, the difficulties of navigating it will be increased accordingly, and it will still remain a small craft on the ocean. Its speed, even if increased, will remain below that of surface ships, and the latter will always out-distance it. There, nevertheless, remains a vast field of activity for submarines, which justifies the efforts made by the principal naval powers in the question of submarine navigation. In the first place, it is important to remark that a battleship can engage in an action against another battleship, but a submarine boat cannot fight another submarine boat; this opinion was expressed by Fulton more than a century ago. When one nation builds a number of battleships, another nation may decide to build a larger number still, and thus regain an ascendancy over the former nation. On the other hand, one naval country may build twenty submarine boats, and a rival nation may build forty such boats. The latter flotilla, though more numerous, remains absolutely powerless to prevent the former from acting against the heavy battleships of the rival nation. (With regard to the range of activity of submarine boats, the author read statements made by Lieutenant Kimball, United States navy; Vice-Admiral Fournier, Capt. R. Daveluy, Admiral Bienaime, and by ourselves; see *Engineering,* vol. lxxiv., page 616.)

It appears to me fully demonstrated that submarine boats allow the defense of coasts and prevent the bombardment of harbors; they render impossible any serious blockade; they prevent an enemy's squadron from mooring off a coast and attempting a landing; in narrow straits they can take up the offensive on the enemy's coast, and can cause the enemy's squadrons to fear being torpedoed as they leave or enter their own harbors; lastly, in European waters, and in certain conditions of weather, they are able to command most of the important merchant marine lines.

The three first objects may be fulfilled indifferently by submarines or by submersible boats; while the two latter can only be effected by submersible boats, these objects requiring a type of craft which is able to keep the sea, a condition which submarine boats proper cannot fulfil. Further, in order to be efficient the submarines must be numerous, for their comparatively low speed makes it necessary that they should form in a sense a close network round the units they have to fight. Their cost has therefore to remain low. Their tonnage also has to be kept within moderate limits in order that they may be navigated with ease. These reasons militate against the use of submarine or submersible boats of 700 to 800 tons, which are costly, difficult to navigate, and which would do less work than two boats of 300 to 350 tons, costing the same price as one of the larger type.

The following may serve for guidance in the selection of a submarine boat:

It would be a great mistake for a navy owning no such craft to believe that it is able from one day to the other to place itself on a level with the naval powers who have been working at the problem for several years past, by building or by purchasing submarines of the largest types built abroad. This manner of proceeding would expose the navy in question to great disappointment, to long groping in the dark, and probably to catastrophes. It is necessary to bear in mind the fact that the larger the submarine, the more difficult it is to maneuver. Diving and evolutions which are very easy with an 80-ft. boat, of 100 or 120 tons, become exceedingly delicate operations when they have to be carried out with one of double the length, and measuring 500 tons. It is necessary, therefore, to proceed methodically. The British navy, for example, commenced by building 120-ton submarines (Nos. 1 to 5), then 204-ton boats (A 1 to A 13), and later those of 313 tons (B 1 to B 11). The United States navy first built the Holland boats, of 74 tons, and continued with the "Adder" type, of 120 tons, the "Cuttlefish" type, of 170 tons, and the "Octopus" class, of 275 tons. By this means it is possible to train both the officers and crews progressively, and for this reason for commanding 400 and 500-ton submarines officers are selected in France who have already navigated the smaller types. It is essential, therefore, to guard against the very grave dangers that may arise from exaggerated dimensions. Moreover, as stated above, very large submarines are unnecessary.

It is important to discriminate between the submarine type and the submersible type.

The submarine, a cigar-shaped boat, has a low buoyancy when navigating on the surface; 5 to 12 per cent of its total displacement when submerged.

The submersible boat, on the other hand, has a hull built on the lines of those of torpedo-boats or destroyers; its buoyancy is high, being 20 to 40 per cent of the total displacement when submerged. In the commencement of 1897 I put forward the design of the first submersible boat, which was built in 1898-1900, and named the Narval.

These main points of difference between both types of boats give the submersible, apart from the advantage in regard to safety, with which I shall deal further on, a greater speed on the surface, better sea-going qualities, and consequently better crew spaces. On the other hand, it has less speed when submerged. A series of experiments was made in France, in 1905, with the submarine Z (220 tons, 7 per cent buoyancy), built on the plans of Mr. Maugas, and the submersible boat Aigrette (250 tons, 30 per cent buoyancy), built on my plans. The results told completely in

* Abstract from a translation of a paper read at the Bordeaux International Congress in Naval Architecture.

favor of the submersible type, and following these experiments, this type of boat alone has been built—eighteen in 1905 and sixteen in 1906, on my designs. The submersible type is, therefore, the one to be adopted, and besides the advantages above alluded to, it has the following: A double hull, which ensures safety in collisions, shocks, etc.; a lower draught for an equal displacement than a submarine when running light; a leak of probably ten tons, which would cause a submarine to sink, would not endanger a submersible boat. These advantages for the submersible boats mean a loss of speed under water, but the advantages remain, nevertheless, beyond comparison.

All attempts hitherto made with a view to utilize one single motor for running both on the surface and when submerged have had no success, and it is necessary to have one or two electric motors, supplied by storage batteries, for cruising under water, and one or two heat-engines for navigating on the surface. The smaller submersible boats, for defending ports and harbors, may be fitted with one electric motor only. With the double motor, however, there is the advantage that, in case of an accident, the boat can navigate should one motor get out of order. Great care should be exercised in selecting the heat-engine for surface navigation, and I have no hesitation in stating that it is absolutely necessary to exclude all motors using benzine, gasolene, and other volatile essences. Such motors can be used for motor-cars, but are extremely dangerous in closed-in craft, such as submarines, a fact which has been proved by the accidents to submarines using gasolene, both in England and in the United States. The selection should be limited to steam-engines, or to motors using heavy petroleum of a density equal to 0.80 at least. These are, it is true, heavier, and take up more space; they do not allow the placing on board of a power equal to that obtainable with benzine or gasolene, but the safety of the crew is the first question to be considered, even if it be counterbalanced by a loss of speed on the surface. A steam-engine, or an explosion motor using heavy oil, can be used indifferently; and of thirty-six 500-ton submersible boats built, or in course of construction, in France in 1904, 1905 and 1906, eighteen are fitted with steam-engines and eighteen with heavy oil motors. Both systems have their advantages and disadvantages. The steam-engine has more elasticity, and lends itself better to speed variations and reversing; it is better known to the personnel of the various navies; its working is safe and less costly. It, however, takes up more space, necessitating, as it does, water-tanks, a boiler, a condenser, etc. It takes longer to start on rising to the surface; it increases somewhat the time for passing from navigation on the surface to navigation under water (by about 1 minute). All these considerations have to be carefully weighed before arriving at a decision.

The question of speed is one which has been argued upon repeatedly. Some navies want a very high speed on the surface, and are content with a low speed when submerged. Others, on the contrary, ask that the speed under water be a high one. The surface speed is the strategic speed, which enables the craft to run rapidly to the required position, to cover in the least possible time a zone in which there are no military operations to carry out. The surface speed should, therefore, be high. The speed under water is a tactical speed —that which is required for attack. The angle in which a ship A can deliver an attack on a ship B under steam is that in which the tangent is equal to the ratio of the speeds of A and B. It is necessary, therefore, to increase as much as possible the speed when submerged. This, of course, applies to the attack of a large unit by a submarine on the high seas. The inefficacy of the submarine out at sea has already been alluded to above; it will come into action more especially in proximity to the coasts, where the large unit will probably not be at liberty to choose either her course or her speed. The very conditions which rule in the construction of submarine boats make it impossible to arrive at very high speeds in both cases, and a compromise has to be arrived at; I believe one must not sacrifice a too great proportion of one speed to the other, and it would appear suitable to reckon upon a speed, when submerged, varying from two-thirds to three-quarters the surface speed.

It is necessary to impress one's mind with the fact that a submarine boat will always experience difficulties in attempting to occupy a good position for launching its torpedoes, either owing to currents or to the state of the sea; the speed of the ship, or ships, to be attacked will also come into play, and it will have also to guard against the enemy's scouts and destroyers. The submarine must not, therefore, carry one single torpedo-launching tube in the bows, as is too often the case, which enables the launching of one single torpedo, and necessitates a complete series of maneuvers, such as the closing of the outside cover, the emptying of the tube, the opening of the inside breach-piece, the introduction of a second torpedo, the closing of the breech-piece, and the opening of the outside cover before a second torpedo can be launched. On may safely say that in ninety-nine cases out of a hundred the occasion will have been lost before all these maneuvers are completed. In my opinion it is necessary that a submersible should have several torpedoes ready for launching at the same time, and the armament has to be so distributed that one or the other torpedo can be launched at will in any order.

The first submersible boat I built—the Narval—carries four torpedo-launching tubes, mounted outside the hull, and independent one from the other; any order can be followed in launching the torpedoes, and this arrangement has been reproduced on all the submersible boats since built. The launching devices are of various types, their number varying from four to six. Four may be taken as a satisfactory number. A bow tube, moreover, is dangerous should there be a collision by the stem; if the small submarine boat Bonite had carried a bow tube when it collided with the battleship Suffren, on Feb. 5, 1906, it would most certainly have sunk, instead of escaping with no very serious damage.

The question of safety of the boat itself is the main question. It should have precedence over all others, and no hesitation should be felt if a selection has to be made between two boats, one of which is far superior in speed and armament, the other being unquestionably the safer of the two, in deciding for the latter. The following conditions, when fulfilled, ensure a maximum of safety: To commence building boats of moderate tonnage, and to increase the tonnage progressively only; to select boats of the submersible type, which are indisputably safer, owing to their double hull and buoyancy, in cases of collision, shocks by the stem, and leaks; never to use for internal combustion motors volatile hydrocarbons; to select electric batteries so arranged that their acid does not risk spilling under lurches of 25° to 30°; no torpedo-launching tubes to be carried in the bow.

France owns at the present time 41 submarines and 47 submersible boats.

As regards speed, I give no figures; those published are generally incorrect, and it has been possible to ascertain repeatedly that the actual speed of certain boats was far different from that which had been promised, or had been stated in various documents. On this question it suffices to say that in all navies one endeavors to reach a 15-knot speed on the surface, and 10 knots under water. No submarine or submersible boat has as yet attained both jointly.

Previous to 1902 the various navies had built, or were building, 55 submarines and six submersible boats only; since Jan. 1, 1902, there have been laid down 71 submarines and 58 submersible boats. I am convinced that evolution will continue on the same lines.

Referring to statements made by Admiral Lord Charles Beresford, Vice-Admiral Fournier, and Lord Goschen, the author added the following: It is quite certain that for those nations who have absolute control over their home waters submarine boats have a lesser scope of usefulness than for other nations. Such is the case for England, Japan, and the United States; but, nevertheless, these powers not only recognize the usefulness of submarine craft, but spend large sums in forming a flotilla of boats of this type. Such being the case, one may judge what great advantage there is for the other navies in the acquisition of submarine boats for the defense of their coasts in conjunction with torpedo-boats. Submarine boats replace advantageously submarine mines, the latter constituting a blind weapon, as dangerous for friends as it is for foes. It is necessary, therefore, to build large numbers of submarine boats of moderate dimensions, in order that the cost of a flotilla should remain within suitable limits.

The submersible type, in certain geographical conditions, can take up the offensive against a more powerful enemy, even were the latter master of the sea; it can also attack the enemy in its own waters.

Flotillas of submarines have an unquestionable scope of usefulness for the large continental powers, and are, it may be added, an absolute necessity for all the smaller states. The statement made by Lord Goschen, in 1899, that the submarine boat was the armament of the comparatively poorer and weaker nations—an absolutely true statement—has so far hardly been listened to by those whom it was aimed at—namely, the secondary powers. Hitherto the construction of submarine boats has been developed mostly by the principal naval nations, and the secondary powers have awaited the results of experiments made by these nations before building or purchasing the new type of boats; a very natural manner of proceeding, considering the very heavy expenses incurred by repeated alterations and trials of a class of boat which is quite different from all others. Now, however, that the experimental period appears to be over, and that types of submarine boats giving satisfaction have been built, an expectant attitude is no longer conceivable. The secondary powers are those who have the most to gain in the development of the submarine boat; they cannot entertain the construction of battleships of 18,000 to 20,000 tons, costing each two millions sterling. Such outlays would greatly exceed their resources. Can they continue on the same lines that most of them follow at the present time, and build small battleships of 2,500 to 7,000 tons? In my opinion, in doing so they incur very useless expenditure, and these smaller battleships are so inferior to the large modern battleships that they would be of no use whatever in a conflict with a large naval power. Could, for example, Holland defend her Indian colonies with 4,500-ton battleships of the Tromp class, against the Japanese Katori or Kashima? One Katori alone could sink half a dozen ships of the Tromp class. Another typical example may be given. In 1807 a British fleet bombarded Copenhagen and destroyed the Danish fleet. Let us suppose (and this is but a gratuitous supposition) that England now wishes to recommence the same operation. What could Denmark do? If, as is the case at the present day, she can only count on seven small battleships, of 2,500 to 5,500 tons, which carry a total of fifteen large-caliber guns, a divison of six or eight British battleships of the fifty owned by England would suffice to gain the mastery. But if, on the other hand, Denmark owned a dozen submersible boats and as many submarines, the former could bar the straits and torpedo the British battleships, while the latter would await near the harbors those battleships which had evaded the submersible boats, and would attack them in their turn. The seven small Danish battleships have cost about two millions sterling; the twelve submersibles and twelve submarine boats would cost together about £800,000.

It is not rash to assert that during the next ten years all the secondary states will have resolutely adopted the new class of boat for their navies. The development of means of defense preferably to that of means of attack forms a first step towards the suppression of wars. In the present state of the civilized world the hope to secure universal peace by a general disarming is a Utopia fraught with great danger.

SOUTHWEST PASS CHANNEL.

Col. E. H. Ruffner, government engineer at New Orleans, sends the following information concerning recent surveys of the South West Pass channel:

During Dec. 11 to 20, soundings were made of the channel above the jetties with the following general results:

1. Deep water is found in the pass about 2,800 ft. above Burrwood, and for 3,000 ft. the depth gradually decreases from 35 ft. to 30 ft.; there being 200 ft. width between the 30 ft. curves.

2. In the next 10,100 ft. the depth decreases from 30 ft. to 25 ft., and the great width of 1,500 ft. between the 25 ft. curves narrows to as little as 400 ft. between the 20 ft. curves.

3. The shoalest part of the channel is now found through the next 4,200 ft., where from 25 ft. to as little as 22 ft. are found, and 400 ft. between the 20-ft. curves.

4. In the next 3,100 ft. is a rapid increase to 35 ft. depth, the 25 ft. channel being not less than 250 ft. wide.

5. Then there is a stretch of 7,500 ft. with not less than 35 ft. depth, the 30 ft. channel being not less than 250 ft. wide.

6. From 35 ft. inside to 35 ft. outside is only 700 ft. by the shortest line; the 35-ft. curve on the outside being 1,600 ft. beyond the ends of the jetties.

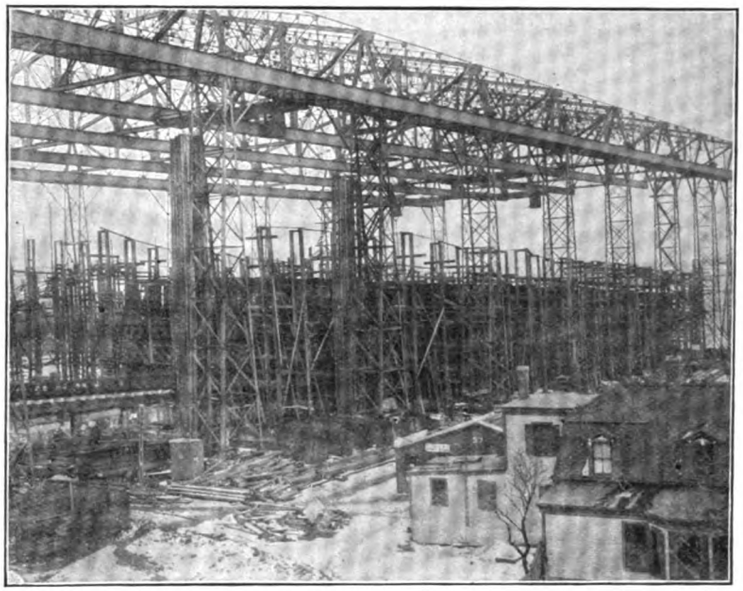
7. From the 35-ft. channel above the shoal water to the 35-ft. curve beyond the jetties is a distance of 20,400 ft.

8. The outer end of the channel was sounded Jan. 25. Three 20-inch suction dredges are now operating in the shoal water opposite and below Burrwood to secure a channel 500 ft. wide and 35 ft. deep, and the result of this work is not embodied in the synopsis above.

The United States dredge Benyaurd, and the General Abbot are also dredging the shoal water, and these five dredges, and the coming high water with its resultant scour should materially improve existing conditions within the coming three months.

BATTLESHIP NORTH DAKOTA.

Herewith is published a photograph of the battleship North Dakota taken at the yard of the Fore River Ship Building Co., Quincy, Mass., on March 3. The work on the battleship is progressing well. The bulkheads around the boiler rooms have been erected and partly riveted. The shell plating up to the line of the protected deck is largely in place and riveted, and stanchions and partial bulkheads throughout the ship have been erected and riveted.



PHOTOGRAPH OF BATTLESHIP NORTH DAKOTA TAKEN ON MARCH 3.

SCOUT CRUISER CHESTER'S TRIAL.

The scout cruiser, Chester, in trials off Rockland, Me., which were ended this week, broke two world records for speed. In a telegram to Secretary of the Navy Metcalf, Rear Admiral Richardson Clover, chairman of the board of inspection and survey, said that the Chester made an average speed of 22.8 knots on her 24 hours' coal consumption trial and on her four-hour speed trial several days ago she made a speed of 26.52 knots. Both these figures are the world's record for naval vessels above 1,500 tons displacement.

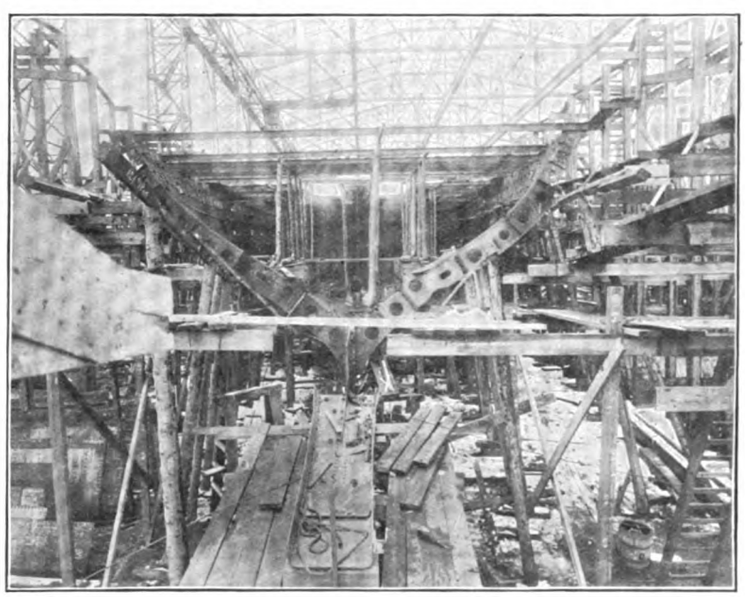
The trial also demonstrated the adaptability of the turbine engine for use on naval vessels. The Chester is fitted with the Parsons turbines and is the first naval vessel to be so equipped. Her contract speed was 24 knots. She was built at the Bath Iron Works at Bath, Me., and is of 3,750 tons displacement. She has an indicated horsepower of 16,000 and has four screws.

The scout cruiser is a new type of vessel in our navy. Three of them are nearly completed and will be placed in commission within the next few months. The Chester is equipped with the Parsons' turbine, the Salem with the Curtiss turbines and the Birmingham with reciprocating engines. It is proposed to have a thorough test made of the practicability of the turbine engine for naval vessels as compared with the reciprocating engine after these vessels are placed in service.

OCEAN MAIL BILL.

Before the board of trade of Lowell, Mass., Secretary Wm. Taft made some pertinent observations on the Ocean Mail Bill presented at the present congress. His remarks were quite to the point, and he is heartily in favor of the measure. He said:

"Now with respect to the merchant marine. That is a subject which calls for closest consideration. You can go the world around and see the American flag, in the Philippines, in Cuba—on the legation—in Porto Rico, and on individual vessels of the United States. But you rarely see it on a merchant vessel. That means that other people are doing our work in exporting merchandise; but I think we all agree that if some method could be devised by which our merchant marine would be put upon the proper basis, and our vessels of peace go out with the flag flying at the foremast, it would be better for our nation, and better for our pride as a people. I think we ought to make an experiment. I think we ought to try and see whether, by a reasonable mail subsidy we may not produce lines between here and South America and between here and the Philippines which shall lead to other developments. We now earn enough in our foreign postal service—some three millions of dollars—that we might well bestow on those who are willing to devote their capital to an industry that would benefit our country."



PROGRESS OF WORK ON BATTLESHIP NORTH DAKOTA—PHOTO TAKEN MARCH 3.

The scout cruiser Birmingham left the yard of the Fore River Ship Building Co. on March 4 for her official trials which begin this week.

FOR THE LAKE MARINE

In this department hereafter will be found everything of current interest pertaining to Lake Navigation. Masters are advised to consult it weekly for information of interest to them; and owners are invited to use it freely for the promulgation of all announcements of a general nature. The Marine Review will be placed aboard every vessel having membership in the Lake Carriers' Association, representing a registered tonnage of nearly 2,000,000 tons, and can, therefore, be depended upon as a reliable courier to the entire fleet. It will reach every vessel in active service weekly. It is the intention to make this department complete so that at the end of the year it will be an authentic record which should prove of permanent and increasing value to owners and masters alike.

Lieut. A. S. Winram, of the United States Revenue Cutter Service, detailed as inspector of life saving stations on the great lakes, addressed the masters of the Pittsburg Steamship Co. at their annual meeting held in the Hollenden in Cleveland in January last, speaking as one sailorman to another. He earnestly recommended the adoption of the International Signal Code as a means of communication between vessels and life saving stations. Lieut. Winram spoke as follows:

ADDRESS OF LIEUT. WINRAM.

"Gentlemen, my time is rather limited, so I won't take very long with my remarks. I have no prepared speech or anything of that sort. I just came here to have a heart to heart talk—one sailorman to another.

"For the last three years, it has been my pleasure, and also I regret that the time is so short, as my tour of duty will soon expire. I have been detailed to inspect the Tenth and Eleventh Life Saving districts, with headquarters at Detroit. The great lakes is divided into three districts. Lake Michigan is known as the Twelfth district and is the only lake that is by itself. The Tenth and Eleventh districts take in the rest of the lakes from Lake Ontario to Duluth. I go from the St. Lawrence river to Duluth, and down to Louisville, Ky. Of course, the work down at the falls of the Ohio is on an entirely different line than on the lakes. While making this tour, among my other duties, I find out what my men know about the International Signal Code. I go to a station and find out if the men there know the various flags comprising the international code, and then I give them a drill. The only practice they get is when a government revenue cutter comes along and runs up a signal. It has occurred to me that we might get in closer touch with each other. It may seem strange to you that I should come here before you and advocate the adoption of something that had its inception centuries ago, in this day when wireless telephone and telegraph are taking up our attention, but at the same time, it is a well known fact that wireless telegraph plants costs money. The day will come when the life saving service will adopt the wireless telegraph. In the meantime, I recommend the adoption of the International Signal Code as a means of communication between vessels and the life saving stations, and also between vessels themselves, it being simpler by far than any other means of communication; consisting as it does merely of a few flags and when I hold up this book, that is, one of the International Signal Codes, I know what you will think or say in your minds. It is a big book! I want to say to you that this book appeals to me for its simplicity. You don't have to learn anything or have any special preparation to take up these signals.

"The first time that such a thing was used was three centuries before Christ. The signal codes of the ancients are believed to have been very elaborate, indeed. Generally, some kinds of flags were used. And in the Middle Ages flags, pennants, and lanterns were used. Before the middle of the 17th century only a few things could be made known by signals. The signal then, and for a long time after depended upon the position in which the light or flag was displayed. Notwithstanding the attention paid to this subject by many, signals continued to be imperfect until late in the 18th century. Along about 1780, a plan was devised, which was the parent of that now in use. Instead of conveying meanings by a solitary flag, they were combined in pairs. About the beginning of the 19th century, the method of conveying the meaning of these flags was greatly improved. In 1856 the British government adopted a system of signaling by flags which was adopted by all maritime nations. That was the beginning of the International Signal Code. At that time it consisted of 18 flags and code pennant. In January of 1903, by international agreement, a new code went into effect, which is the one now in use consisting of 26 flags and code pennant. This was prepared by a committee appointed by the British board of trade. Flags are hoisted in combination of two, three or four, or singly. One-flag signals are not very much used. Two flags are used in cases of danger or disaster. Three flags are general signals. Four flags are spelling tables, vessels' numbers, etc. Each combination of flags stands for a sentence or a single word. Foreign can communicate with one another as well as vessels of the same nationality. I merely tell you this as I thought it might be of interest to you. Of course, the conditions as relates to foreign vessels would never come up on the lakes.

"It has often occurred to me in looking over this book, that there is a great deal of it that could be applied to any use whatever on the lakes, but at the same time, there are many things in here that could be utilized by you vessel men. Among other things are the urgent and important or danger or distress signals. Now, I would like to ask any one of you what do you consider your signal of distress. (One of the masters said four long blasts of the whistle.) At the same time this book was adopted, there was also adopted international signals of distress which are very simple indeed. Now in the life saving service every time I go to a station I ask the men independently to give me the signals of distress for day and night. The signal for day is a gun or other explosive fired at intervals of about a minute. The international signal of distress which is used the world over is indicated by the letters "N. C." (Lieut. Winram described the various international day and night signals of the International Code, what they mean, etc.)

"Now, it often occurs, and as I will show you, there are other signals of distress for day and night. Last summer there was a wreck on the lakes, which I investigated. The vessel was in distress most all the afternoon. It was in such a gale of wind as the Pittsburg Steamship Fleet would pay little attention to, but nevertheless the vessel was in distress. I asked them why they did not blow their whistle, and they said they did until the whistle cord was carried away. I asked them why they did not hoist a square flag with something above or below it, one of the international distress signals. This was Greek to them. I merely say this to illustrate to you men that there are more ways than with flags to make a distress signal. (Lieut. Winram described a case on the ocean where a small British whaling schooner had hoisted a square flag made out of a marble oil cloth table cover and hoisted a bucket as

it was the nearest to a ball that they had. Another steamer saw it and came to their assistance.)

"Of course, it isn't always handy to have an oil or tar barrel on deck to signal with at night but we now have what we call the water light. I want to preface my remarks by saying I don't know who this is made by and I am not here to recommend any particular brand but this water light is made, I think, of calcium carbide. They are on our government vessels at sea. Now, if you will carry on board your ships some of these water lights, they will take the place of flames on the vessel from an oil or tar barrel. I have never seen these used in practice but I am told they will burn an hour in the water. I would suggest, if I might, it would be a good plan for you to carry a few of these water lights. We never know what is going to happen to us at sea. While I have been in the life saving service I have tried to install some sort of understanding of this International Signal Code; I have caused my men to memorize a few of the more important two-flag signals, so when they see them displayed by anybody, they will not have recourse to the book to learn their meaning. Another point about these signals is the small cost—only one set of flags and the book. If you had them on board your vessels, as we have them at the life saving stations we could talk back and forth. Say you had a steam pipe burst on Lake Superior near White Fish Pt. and you wanted a doctor to be ready for you at the Sault. If you had the signal my people there could telegraph or telephone to the Sault and have things ready for you there and it might be the means of saving a man's life. If you had a damaged rudder and could not steer, you could tell some other vessel. (Lieut. Winram explained further with reference to the use of the code on the ocean.)

LIEUT. A. S. WINRAM, OF THE UNITED STATES REVENUE CUTTER SERVICE.

"I would like to call your attention a few moments to the signals in use by the life saving service at wrecks. Upon the discovery of a wreck by night, the life saving force will burn a red rocket to signify, 'You are seen, assistance will be given as soon as possible.' No doubt some of you men have at one time or another seen this. A red light at night or a red flag waved on shore by day in connection with our beach apparatus rescue work will signify to you 'To haul away.' A white light by night or a white flag by day will signify to you 'To slack away.' Two flags, a red and a white, waved on shore by day, or two lights, a red and a white swung at the same time or a blue light burned at night, will signify 'Do not attempt to land in your own boats, it is impossible.' A man on shore beckoning by day or two torches burning near together at night will signify 'This is the best place to land.' This, you will appreciate, is important to us in working our beach apparatus.

"Now a few things about the life saving service. The last few years, and during the recent prosperity we have undergone, it has been rather a hard matter for us to keep up the service to the point where we would like to have it. We only pay our surfmen $65 a month for about eight months of the year. We pay captains $75 a month the year around. It is very hard indeed to get proper, well equipped men for the service on account of the small salary paid them. We have been up against it on the lakes here and many of the most important stations. Instead of having a crew of good, first-class men we have to hire what is known as a temporary man; a man absolutely out of our hands so far as discipline is concerned because he hasn't signed any articles and

all he has to do is to quit if he doesn't like things. I don't know that I can see any relief in sight unless congress increases their compensation or else gives them a pension. We are trying for this now and have been for a number of years.

"The life of the crew is not one of pleasure. The beaches have to be constantly patroled at night no matter what the weather is.

"Among other strides we have made in the last few years is that of getting gasoline engines in the boats. You will appreciate that it is very hard for the crew to pull our big boats which weigh in the neighborhood of six tons and their carrying capacity is very great. The engine we are installing in these boats now is light and is speedy and is about the most reliable we can get. We also have surf boats, but you take one of your own vessels and we couldn't begin to carry her whole crew in one of our surf boats, but our big life boats would carry them. What I have been trying to do since I have been up on the lakes is to get power into all of our big 34 ft. life boats. The district superintendents and myself have recommended putting in these 34 ft. life boats at the stations where they do not have them; Ashtabula, for instance, is one place.

"I should also think it would be rather a good scheme to carry on board your lake vessels some kind of a gun like the Lyle gun. It would greatly facilitate the work of the life saving crew at times if you could shoot lines ashore from the vessel.

"Now, I don't want to take up any more of your time. I used to be up on the lakes a good many years ago and I well remember the day when we thought the Maruba and the Masaba were big ships.

"There is one thing more I want to take up and that is a few simple rules for resuscitating the apparently drowned. If I had my way this would be taught to every child in the public schools throughout the land. The rules are so very simple that any one can easily learn them. This doesn't necessarily apply to your life aboard the ship, but it might apply to your life in other places. We in the life saving service have a set of rules for the resuscitation for the apparently drowned. Among other things we have our men memorize those rules so that they can repeat them. I must say myself that we have done splendid work along this line. We have succeeded in many cases in bringing a man back to life after working over him three or four hours. (Lieut. Winram told of a case where two life savers who were employed in a mill during the winter months up in a village had brought a girl back to life who had been taken out of a creek apparently drowned, and whom a physician had ordered laid out for dead and had objected to the life savers working over the girl, as he thought it was useless.) I myself had occasion up at Belle Isle in Detroit to practice resuscitation. The thing is so simple I think I shall ask Mr. Coulby if he won't have these rules printed sometime in his bulletin. (Applause.)

ATLANTIC COAST GOSSIP.

Office of the MARINE REVIEW,
Room 1005, No. 90 West St.,
New York City.

The number of arrivals of vessels of all classes and from all ports at the port of New York during the month of February was 586. Of these 305 were from foreign and 281 from coastwise ports.

It is said that at least $1,000,000 is to be spent by the government in modernizing and improving warships now lying at the League Island navy yard. This will mean employment for several thousand Philadelphia mechanics for some time to come.

The steamship Rotterdam, the 24,170-ton Holland-American liner which refused to take the water on Feb. 23, was successfully launched on March 3 at the yard of Harland & Wolff, Belfast.

The tug Edgar F. Luckenbach, which was sunk some time ago in a collision with the steamer Pawnee off the Battery, New York, has been raised by the Merritt-Chapman Wrecking Co. The collision occurred during a dense fog, one member of the Luckenbach's crew losing his life.

The Cosmopolitan line expects to dispatch eight steamers from Philadelphia this month to the various ports in the United Kingdom and on the continent. The agents have contracts covering 30,000 tons of merchandise for export.

The sailing list of the International Mercantile Marine Co. for Saturday last showed the combine maintaining an hourly ferry service to Europe. The Atlantic transport liner Mesaba sailed for London at 9 a. m.; the American liner Philadelphia, for Southampton, at 10 a. m.; the Red Star liner Kroonland, for Antwerp, at 11 a. m.; and the White Star liner Republic, for the Mediterranean, at noon.

The square-rigged ship Preussen, the largest sailing ship in the world, is on her way here from Hamburg to load 200,000 cases of petroleum for Japan. The cargo will contain 2,000,000 gallons of oil.

The Preussen is steel built, 408 ft. long, 53½ ft. beam and of 5,081 registered tons. Her cargo capacity is 8,000 tons. She carries a crew of 58 men, and is on her maiden voyage to this country.

Col. Edward S. Fowler, collector of the port of New York, wants to oust Station P of the post office from the new Custom House building. Col. Fowler was in Washington, Monday, and held a conference with Secretary Cortelyou. It is understood that the transfer of the post office to some other building was considered. The government saves a rental of $20,000 with the post office in a federal building.

Henry B. West, who for the past 23 years has been the chief shipping man with the import and export house of Crossman & Siecken, beginning this week will be associated with Norton & Son, ship brokers and agents for a number of important steamship lines. In making the change, it is announced, Mr. West seeks a wider field. As a testimonial of the esteem in which he is held, Mr. West's associates in the house of Crossman & Siecken on Saturday presented him with a gold watch suitably inscribed.

Alfred Brooks Fry, chief engineer and superintendent of the United States public buildings, has just completed and forwarded to Washington tentative plans for enlarging the United States barge office at the Battery and increasing the dock facilities for the government boats. It is thought probable that congress will appropriate $600,000 for the work, which will mean another step in beautifying the city's water front.

LIFE SAVING SERVICE.

The Lovering bill, intended to improve conditions in the Life Saving Service, will be reported to the house in the near future and there is reasonable hope of its passage. The personnel of this service has been in wretched shape for several years past owing to the fact that there has been no permanency of employment, the surfmen being invariably discharged in the fall to get through the winter as best they could. The Lovering bill contemplates engaging them for the full year, granting a 10 per cent increase in wages every five years and providing a pension for old age. For pension purposes the bill provides that a lieutenant of the Life Saving Service shall have the same rank as a lieutenant of the navy, the keeper of the station the same rank as an ensign, and a surfman the rank of a warrant officer.

LACKAWANNA STEAMSHIP CO.'S BONDS.

The Cleveland Trust Co. in association with the First National Bank of Cleveland have purchased $850,000 of the Lackawanna Steamship Co.'s first mortgage 5 per cent gold bonds and are now offering them to investers at 98 on any maturity making the bonds yield from 5.30 to 6 per cent. The maturity of the bonds extends from 1909 to 1918. This is about as choice an investment as has ever been placed on the local market and is unhesitatingly recommended to anyone desiring a safe and lucrative investment.

The ordinary steamship bond on a lake freighter, designed for the coal and ore trades, can be honestly recommended anywhere, but this particular issue is especially gilt-edged owing to the interests which form the Lackawanna Steamship Co. This company is operated by Pickands, Mather & Co., of Cleveland, and carries ore for the Lackawanna Steel Co. of Buffalo. The steamship company is owned by men associated with Pickands, Mather & Co. and the Lackawanna Steel Co., and the steamers are practically employed to carry ore from their own mines to their own furnaces. The officers and directors of the Lackawanna Steamship are: H. G. Dalton, president and treasurer; Samuel Mather, vice president; E. P. Williams, secretary; Moses Taylor, James H. Hoyt and R. G. Dunham, directors. Messrs. Dalton, Mather and Williams are connected with Pickands, Mather & Co. of Cleveland; Moses Taylor is the vice president of the Lackawanna Steel Co. of Buffalo; James H. Hoyt is of the firm of Hoyt, Dustin & Kelley, of Cleveland, and R. G. Dunham, of Armour & Co., Chicago.

The bonds are secured by a first and blanket mortgage on the modern steel bulk freighters Calumet, Odanah, Crete, Adriatic, Verona, Elba and Hemlock at about 43 per cent of their actual cost of construction. These boats were built in 1907 at a cost of $1,970,000. The capital stock of the company, issued and fully paid, is $1,120,000 with a bond issue of $850,000. The Adriatic, Calumet, Elba, Hemlock and Odanah have a carrying capacity of 7,500 tons of ore and the Verona and Crete of 8,500. Their size makes them extremely serviceable permitting them to enter both the coal and ore trades with equal facility. Larger boats frequently find it inconvenient to take on coal cargoes owing to location of docks.

The trust deed or mortgage under which these bonds are issued has been carefully drawn to safeguard the interest of the bond holders and to comply with the law passed by the Michigan legislature in 1905 making bonds of this class a legal investment for Michigan savings banks. By its terms 1/10 of the issue must be paid annually, commencing Dec. 15, 1909, which increases the margin of security on outstanding bonds from year to year as the issue is reduced by these payments. The mortgage also limits the amount of floating indebtedness that the company may incur to 5 per cent of the original principal of the mortgage and requires the steamship company to furnish the trustee with annual statements of such outstanding indebtedness. The mortgage furthermore contains strict provisions that each vessel be kept fully insured for its full insured value against all risks including fire, marine risks and disasters, general and particular average, collision liability, protection and indemnity insurance and insurance against liability for injury to persons. The amount of such insurance must be at least 25 per cent in excess of outstanding bonds and placed with companies and under forms of policy satisfactory to the trustee. All policies are deposited with and made payable to the trustee for the benefit of the stockholders.

Steamship bonds issued under these careful provisions occupy an enviable position among investment securities. During the past 15 years about $20,000,000 of these bonds have been purchased by banks, trust funds, private investors, insurance companies and colleges throughout the great lakes region. There is yet to be disclosed a single instance of default in payments of either interest or principal when due.

BATTLESHIP INQUIRY.

Testimony was adduced this week before the senate committee on naval affairs, which is investigating the criticisms of battleship construction, showing that the location of the armor belt of American battleships was too low. A letter from Secretary Metcalf was also read, declaring it to be the opinion of the board of construction and Rear Admirals Evans and Brownson that the armor belt lines of the battleships Delaware and North Dakota, now building, were right.

Lieut. Richard D. White, assistant inspector of target practice, said it was his observation that the ships had greater draughts than they were designed to have, which sunk the armor belt. He thought the draughts would be still greater under war conditions. He condemned the present direct ammunition hoists in the ships' turrets as inefficient.

Rear Admiral George C. Remey, retired, said he would locate the armor belt with reference to the proper load-water line when the ship is equipped to go into battle.

The testimony of Rear Admiral C. F. Goodrich, commandant of the New York navy yard, was listened to with interest. After the publication of the Reuterdahl criticisms, he said in an interview that he had called attention years before to such defects as were alleged by Reuterdahl. Asked by Senator Hale if he would subscribe to Reuterdahl's statement that if our ships went into action they would be no better off than the Russian ships when they met the Japanese, he said: "Oh, no, sir," his positive manner indicating that he thought there could be no comparison.

In regard to the location of the armor belt, he said he concurred in the testimony of Admiral Remey. He thought the interrupted ammunition hoists better than the direct type.

Senator Tillman called attention to the fact that Commander Sims gave the name of Admiral Goodrich as one of the men who would corroborate him in the declaration that the department would not accept officers' criticisms. The admiral looked annoyed.

"Have you made reports to the department criticising any matter of construction?" asked Mr. Tillman.

"I have made several suggestions which have not borne fruit," Admiral Goodrich said, and then related that in 1902 he had recommended the abolition of the military masts with their fighting tops. The ships now being designed, he said, do not have these fighting tops.

Directors of the New York Dry Dock Co. have declared in addition to the regular semi-annual dividend of 2 per cent on the $10,000,000 preferred stock, an extra dividend of ½ per cent on this issue, thereby increasing the disbursement to be made April 15, from $200,000, the regular half-yearly amount, to $250,000.

W. J. Pulling & Co. of Windsor have sold the steamer Juno and consort Sligo to Haney & Miller, Toronto. The new owners are dredging contractors who will use the two in hauling stone on Lake Erie and Lake Ontario.

WRINKLES IN PRACTICAL NAVIGATION.

The 15th edition of Lecky's "Wrinkles in Practical Navigation" is just from the press. What Shakespeare is to the player so is Lecky to the navigator. The 15th edition has been revised and enlarged by Wm. Allingham, who was for many years the close personal friend of the late Capt. Lecky, and who discussed frequently with him the future of "Wrinkles." This new edition repeats the preface to the first edition and to the ninth edition as written by Capt. Lecky. Concerning the 15th edition, Mr. Allingham says:

"It has devolved upon me to revise 'Wrinkles' for this 15th edition and in the task I have been greatly helped by a knowledge of Capt. Lecky's methods and his aims with respect to the book. Something new and true has been added; some of the chapters have been rewritten, consequent on changes which could not have been foreseen by the author; and neither time nor trouble has been spared to bring the book right up to date. It is therefore anticipated with some degree of confidence that 'Wrinkles' will at least maintain the high reputation it has held among the world's navigators ever since the first edition brought out by Capt. Lecky a quarter of a century ago." While this book is not written in any respect as a direct help to the local marine board examinations, there has been no departure from Capt. Lecky's general plan which was well expressed in his first edition as follows:

"Should experts complain that they do not find anything novel in this volume, the writer would merely remind them that it was not his intention that they should. The book has been prepared for comparatively young members of the profession; and one of the leading objects has been to elucidate in plain English some of those important elementary principles which the savants have enveloped in such a haze of mystery as to render pursuit hopeless to any but a skilled mathematician. Comparatively few sailors are good mathematicians and in the writer's opinion it is fortunate that such is the case; for Nature rarely combines the mathematical talent of a Cambridge wrangler with that practical tact, observation of outward things and readiness on an emergency so essential to a successful sea captain, who, curiously enough, is always expected to be as many sided as the 'Admiral Crichton,' at once sailor, navigator, parson, lawyer, doctor and a host of things besides."

"Wrinkles" is for sale by the MARINE REVIEW. Price $9.

QUESTIONS FOR WHEELSMEN AND WATCHMEN.

413. Where do you find the sluice valves?

414. If it were necessary after your boat was loaded to get into the water bottoms how would you go about it?

415. How would you locate where the manhole plates lay under the cargo?

416. If your wheel chains should part in a seaway, what is the first to be done?

417. Before making a dock what action would you take regarding your mooring machines, deck-pony, capstans and windlass?

418. What in your opinion is a handy length for a heaving line?

419. What equipment should a lifeboat have in order to pass inspection?

420. After a life boat has been in use and you have landed it in the saddles and secured it properly, what should you be extremely careful about in stowing away the gear?

421. Give the code of starting, stopping and backing signals to be made by bell or whistle between the master and pilot and engineer on the great lakes?

422. What is a certificate of inspection?

423. What is a wrecking box and what is its use?

QUESTIONS FOR MASTERS AND MATES.—NO. 61.

793. What is the difference between co-latitude and polar distance?

794. The latitude is 38° 43′ N, what is the co-latitude?

795. The declination is 38° 43′ N, what is the polar distance?

796. What is the increase of the latitude scale on a Mercator's chart in Lat. 44?

797. What is the meridianal part for that latitude?

793. How many miles in a degree of longitude on the parallel of 30°?

799. What is zenith distance?

800. The zenith distance is 38° N, declination 12° N, what is the latitude?

801. Lat. 42° N, what is co-latitude; Dec. 15° N; what is approximate meridian altitude; also zenith distance?

802. Why is it that declination added to or subtracted from zenith distance gives the latitude?

ANSWERS TO QUESTIONS FOR WHEELSMEN AND WATCHMEN.

391. 6⅞ points, nearly.
392. 66° 05′ 37″.
393. 1° 24′ 22″.
394. 42′ 11″.
395. 21′ 5.5″.
396. 1,350′.
397. 2,700′.
398. 162,000.
399. 37° 58′ 27″.
400. 6¼ points nearly.

FEBRUARY LAKE LEVELS.

The United States lake survey reports the stages of the great lakes for February, as follows:

Lakes.	Feet above tide-water, New York.
Superior	601.87
Michigan-Huron	580.51
Erie	572.13
Ontario	246.99

Since last month Lake Superior has fallen nearly 3 in., and Lake Erie has fallen 4¾ in. Lakes Michigan and Huron have risen an inch, and Lake Ontario 3 in. Ice in St. Clair river has held the water in Lakes Michigan and Huron, giving them a rise at the expense of Lake Erie, which has lowered in consequence.

In the next month Lake Superior is likely to fall about an inch, Michigan-Huron may rise an inch, and Lakes Erie and Ontario 2 in.

Lake Superior is 10½ in. higher than in February, 1893, and ½ in. higher than in 1899; but it is 2¼ in. lower than last year, 6¾ in. lower than in 1906, and 3¼ in. below the mean February stage of the past 10 years.

Lakes Michigan and Huron are 1¾ in. lower than in February last year, lower by 10½ in. than in 1877, and the same height as in 1891; but they are ½ ft. higher than the mean February stage of the past 10 years, 8½ in. higher than in 1903, and 16 in. higher than in February, 1896.

Lake Erie is lower by 4 in. than in February last year, 6½ in. lower than in 1890, nearly 1 ft. lower than in 1882; but it is 2½ in. higher than in February, 1906, 10 in. higher than in 1905, and 7¼ in. higher than the average February stage of the past 10 years.

Lake Ontario is 6½ in. higher than in February last year, 10¾ in. higher than in 1906, 18 in. higher than in 1905, 24 in. higher than in 1904, 38 in. higher than in 1896, and 21½ in. higher than the mean February stage of the past 10 years. It shows the highest February stage since 1886; it was 8 in. higher in that year. Lake Ontario promises to show an exceeding high stage for the coming season.

75-TON FLOATING CRANE FOR MONTREAL.

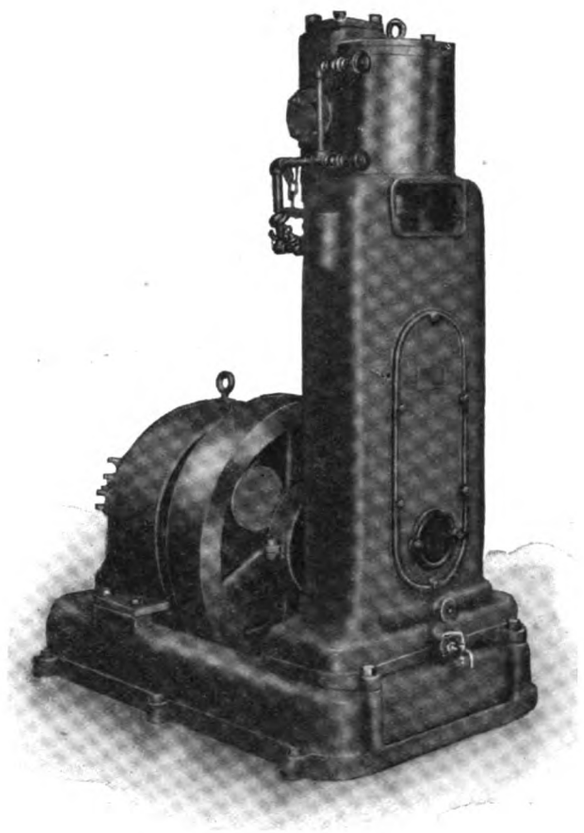
The 75-ton steam floating crane for the harbor authorities at Montreal, the contract for which has lately been placed with Messrs. Vickers Sons & Maxim, Ltd., of Barrow-in-Furness, will prove a valuable addition to the equipment of that port, because of the varied work which it may undertake. It will be easily moved from ship to ship, so that while a vessel is discharging or loading ordinary cargo at the usual berths, heavy loads, such as locomotives, etc., can be moved to and fro from the holds with great facility. This will be further facilitated by the considerable radius at which the maximum load of 75 tons can be lifted, while the height of the revolving derrick will give an even greater vertical range—100 ft. The Vickers Co. will itself build the pontoon, while the crane is to be supplied by Applebys, Ltd. The barge, or pontoon, is to be 200 ft. long, of 43 ft. 10 in. extreme breadth, and very heavy transverse and longitudinal girder work will be built into the hull for carrying the crane and its mechanism. There will be about 300 tons of ballast to insure the stability of the floating structure irrespective of the position of the maximum load on the crane. This crane will be of the revolving derrick type. The maximum load will be, as already stated, 75 tons, at a radius of 51 ft., but it will be possible to take 60 tons at 66 ft. radius, and 10 tons at 72 ft. radius. The crane structure will comprise three distinct parts—the revolving structure, carrying the machinery and jib, the jib itself, and the derricking link. The steam engine for actuating the lifting gear will have 9-in cylinders and a stroke of 18 in. The crane will revolve on a set of 64 conical rollers running on two steel races, an upper and lower, the latter having teeth to form the slewing rack into which will gear the slewing pinion. For driving the latter there will be a special steam engine with cylinders 8½ in. in diameter and 12 in. stroke, with friction clutches and gear. The moving counter-balancing ballast will be racked in and out by one of the slewing gear engines. The derricking gear will be arranged to work from the barrel pinion shaft by means of clutches and gear revolving a screw working in a heavy gun-metal nut mounted on trunnions and carried on the lower end of a braced-up steel link. The pontoon will, of course, carry the steam-generating plant and electric-lighting machinery, and a cabin for the accommodation of the men when manipulating the crane will be constructed at a considerable altitude. The floating crane will thus be entirely self-contained.

GREAT LAKES REGISTER.

The 1908 edition of the Great Lakes Register has been issued and is now being delivered to subscribers. The Great Lakes Register has been adopted by the lake underwriters as their official classification register for all insurance purposes. Vessel owners have all been notified of this action and the Register is now receiving applications for classifications daily. As it was necessary to send the Register to press before the arrangement with the underwriters was reached it was impossible to publish in the 1908 issue the classes of all vessels that applied for classification. Monthly supplements will therefore be issued to the Register, giving the classes assigned as rapidly as the vessels are inspected. The rules and regulations for the building of vessels have been thoroughly revised and will be sent to all subscribers within a short time.

FISHER MARINE GENERATING SET.

The Fisher Electrical Works has recently placed on the market a new direct-connected, vertical marine generating set, as shown in the illustration. This machine is a two-bearing



FISHER MARINE GENERATING SET.

machine with all moving parts of the engine entirely enclosed. By removing the front plate, however, the cross head, connecting rod and moving parts are accessible for examination and adjustment.

This type of machine excels the three bearing or center crank engine in that the shocks due to sudden changes in load are not transmitted through the crank pin. The fly wheel and governor are placed next to the main bearing eliminating an objectionable overhang as it is supported together with the armature between two bearings. The dynamo is of the 8-pole type, automatic in operation between full and no load, and embodies the latest practice in this class of engineering. The generating set illustrated is built in sizes from 8 to 125 kilowatts.

LAKE SHIP YARD METHODS OF STEEL SHIP CONSTRUCTION.

BY ROBERT CURR.

Fig. 10 shows the arrangement of the rivets in beam ends. A is channel frame, B bracket plate beam and C the channel. The beam C and frame A are of 12-in. channels so that the same consideration in regards the number of rivets is adopted as in example of Fig. 7.

This applies to a whole beam which crosses the ship and may be considered one piece from keel to keel.

The deep floors, Fig. 2, which are spaced 12 ft. apart are scored out to the depth of the girders 45 in.

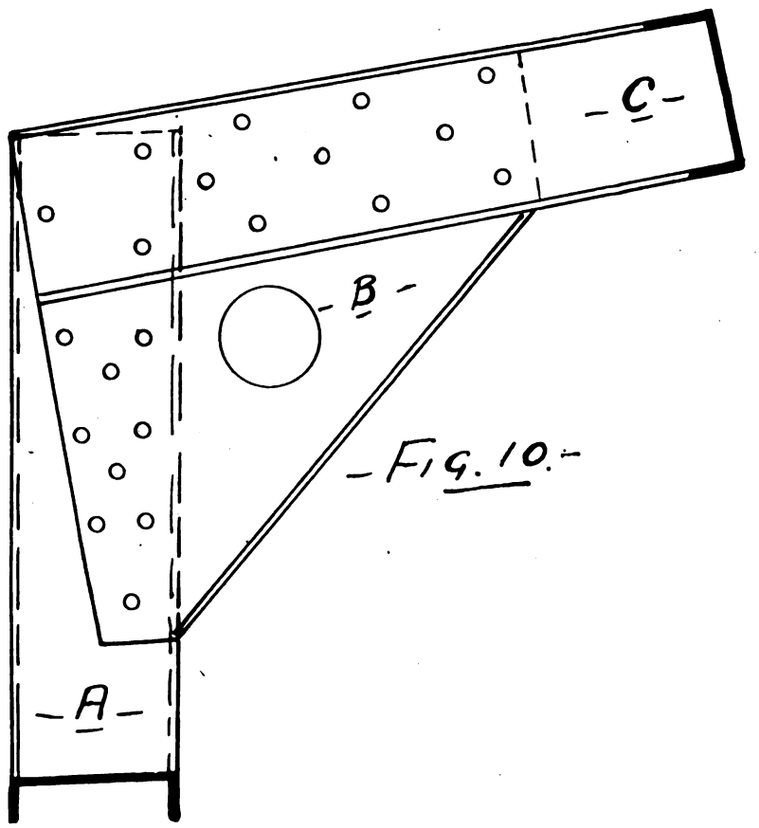


Fig. 10.

The loss of material by punching out equals 45 in. × ⅜ in. × 26 = 442 tons tensile strength. The material left is 315.40 tensile strength. This material is composed of 15-in. x ⅜-in. plate below the girder, frame angle, top angle and seven rivets connecting the angles to floor plate and girder.

The weakest part of the floor plate where punched out for the girder is 93.88 tons stronger under tension than through the weakest part of the ordinary frame, Fig. 9. The connecting of the deep floor to the center keelson is the same as described in Fig. 9 and shows that the weakest part of the floor plate is 77.40 tons stronger under tension than the riveted connection to the center keelson.

The material of value to the floor plate consists of floor under girders	15 × ⅜ × 26 = 146.12
The material of value to the floor plate consists of frame angle	6 × ⅜ × 26 = 58.50
The material of value to the floor plate consists of top angle	6 × ⅜ × 26 = 58.50
The material of value to the floor plate consists of rivets in corner angles	7 × 12 tons = 84.10
	347.12
Less for rivet holes	31.72
Tensile strength	= 315.40

In these deep floors man holes are cut out to allow a passage through the bottom.

The man holes are 20 in. wide and the strength through same amounts to 460 tons exceeding the weakest part at the girder connection by 144 tons.

The punching out for the girders does not decrease the strength of the floor plate in comparing same with the connection to the center keelson.

The rivet arrangement on a deep floor is simply to have a spacing of eight diameters of the rivets. The deep floor serves the purpose of a plate girder which strengthens the bottom to resist cross-ship buckling.

The punching out of the floors to allow the longitudinals to run continuously along the ship on top of channel floors is considered the best method, seeing it is universally adopted on the great lakes.

The watertight floors, Fig. 4, have a rivet spacing of 4½ diameters which practically cover all there is to the riveting of same.

The material is far in excess of anything anywhere else on the vessel.

The cutting out for the girders is taken good care of seeing watertight collars are fitted around each and in such a way that the collars form a brace between the girders.

The water tightness of this part being the main object.

The bulkheads, Fig. 3, the rivets are numerous and the only thing considered is the pitch. In watertight bulkheads a pitch of 4½ diameters is adopted in the plates and frames and seven to nine diameters in all stiffeners. The riveting through the shell never varies from about six diameters.

Bulkheads not watertight have a pitch of rivets six diameters in seams and butts and frames seven to eight diameters.

Bulkheads seldom have doublings on the body of the bulkheads.

The after collision bulkhead as a rule is doubled in way of the shaft in steamers or the plate where the shaft passes through is made thicker.

Fig. 11 shows an arrangement of riveting and butt connection on center keelson.

The plate is 60 in. wide and 9-16 in. thick and all the riveting is ⅞ in. diameter.

The line through the rivet holes AB shows the unavoidable weakest part and the rivet holes at butt shows the number and arrangement of rivets to retain the strength throughout the center keelson similar to line AB.

At the line AB the rivet holes are spaced 7 in. apart and are nine in number, including the rivets in top and bottom angles.

These nine rivet holes reduce the area of the plate from 33.75 sq. in. to 29.01 sq. in. Example: 60 — 8.44 = 51.56 in.

51.56 × 9 16 in. × 26 = 754 tons tensile strength of punched center keelson plate through the line of rivet holes AB, Fig. 11.

The value of a ⅞-in. diameter rivet being equal to 15 tons it will require 50 rivets to fasten the butt together, in order to retain the strength of weakest sec-

tion through AB, Fig. 11. Example:

$$\frac{754}{15} = 50.25 \text{ rivets.}$$

The arrangement of the rivets shown with this size of lapped butt is all that can be done to come near to the material through line AB.

The rivets nearest the edge of the plate CD have a pitch equal to AB,

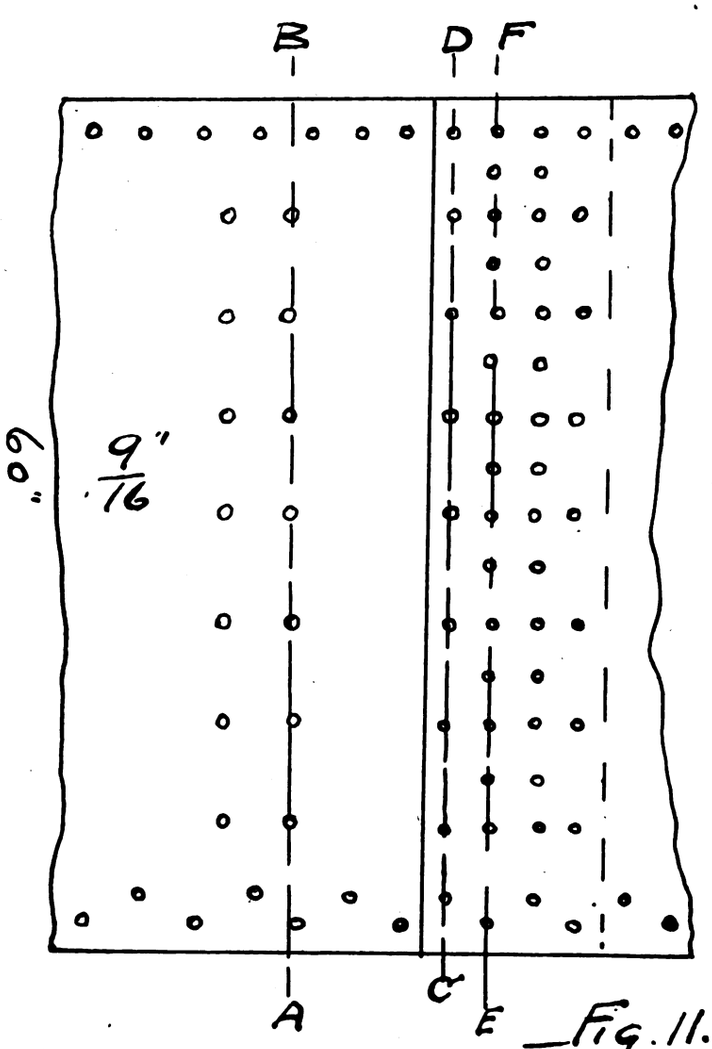


Fig. 11.

which leaves that section in both cases equal.

There is a possible chance of fracture at the line EF by the plate breaking and shearing the rivets through line CD.

The holes in middle of the butt are spaced half the distance of those at the outside reducing the area of section considerably. The plate through the line EF has only a tensile strength of 24 tons per sq. in., owing to the closer pitch of rivets. Example: 60 — 17 rivet holes = 44 in.

44 × 9-16 in. × 24 tons per sq. in = ... 608 tons

Rivets through CD equals 15 × 9 = ... 135 tons

743 tons

754 — 743 = 11 tons less than through line AB. By reducing the rivet holes through the line EF it would reduce the number of rivets, which would not be advisable.

To make this butt equal to AB, Fig. 11, the width of the lap would require to be increased, which would allow for five rows of rivets and ensure $50 \times \frac{754}{15}$ in. diameter as per example of $\frac{754}{15}$ – –

The butt connection with the least material and labor is the most desirable for a ship and the lapped butt gives the desired results.

A double strap giving a double shear to the rivets is sometimes adopted, but it is not so useful in watertight work seeing three thicknesses of material has to be contended with.

DECAY IN WOOD PREVENTED.

It is estimated that a fence post, which under ordinary circumstances will last for perhaps two years, will, if given preservative treatment costing about 10 cents, last 18 years. The service of other timbers, such as railroad ties, telephone poles, and mine props, can be doubled and often trebled by inexpensive preservative treatment. Today, when the cost of wood is a big item to every farmer, every stockman, every railroad manager—to everyone—in fact, who must use timber where it is likely to decay—this is a fact which should be carefully considered.

It is easy to see that if the length of time timbers can be used is doubled, only half as much timber will be required as before and only one-half as much money will need to be spent in the purchase of timber. Moreover, many woods which were for a long time considered worthless can be treated and made to last as long as the scarcer and more expensive kinds.

Of the actual saving in dollars and cents through preservative treatment, a fence post such as was mentioned at the beginning might serve as one example. The post is of loblolly pine, and costs, untreated, about eight cents, or, including the cost of setting, 14 cents. It lasts about two years. Compounding interest at 5 per cent, the annual charge of such a post is 7.53 cents; that is, it costs 7.53 cents a year to keep the post in service. Preservative treatment costing 10 cents will increase its length of life to about 18 years. In this case the total cost of the post, set, is 24 cents, which compounded at 5 per cent, gives an annual charge of 2.04 cents. Thus the saving due to treatment is 5.49 cents a year. Assuming that there are 200 posts per mile, there is a saving each year for every mile of fence of a sum equivalent to the interest on $219.60.

In the same way preservative treatment will increase the length of life of a loblolly pine railroad tie from five to 12 years and will reduce the annual charge from 11.52 cents to 9.48 cents, which amounts to a saving of $58.75 per mile.

Circular 139 of the Fence Service, "A Primer of Wood Preservation," tells in simple terms what decay is and how it can be retarded, describes briefly certain preservatives and processes, gives examples of the saving in dollars and cents, and tells what wood preservation can do in the future. The circular can be had free upon application to the Forester, Forest Service, Washington, D C.

LOCK AND DAM, BIG SANDY RIVER.

Abstract of proposals for raising crest of lock and dam No. 3, Big Sandy River, near Louisa, Ky., and constructing steel gates for the lock, received in response to advertisement dated Dec. 20, 1907, and opened Jan. 20, 1908, by Lieut. Col. J. G. Warren, Corps of Engineers, U. S. A., at Cincinnati, O.:

Classification.	Approximate Quantities.	(1) The Midland Bridge Co. Kansas City, Mo. Unit.	Total.	(2) The Dravo Contracting Co. Pittsburg, Pa. Unit.	Total.
Excavation .....cu. yd.	1,500	$ 10.00	$ 15,000.00	$ 2.00	$ 3,000.00
Embankment .....cu. yd.	500	.75	375.00	1.00	500.00
Concrete .....cu. yd.	1,900	13.00	24,700.00	9.00	17,100.00
Riprap .....tons	1,000	3.50	3,500.00	3.50	3,500.00
Paving .....sq. yds.	700	2.00	1,400.00	4.25	2,975.00
Bolt holes .....lin. ft.	500	.60	300.00	1.00	500.00
Removal of weir sill.....lump sum	.....	.....	5,000.00	.....	2,000.00
Removal of lock gates.....lump sum	.....	.....	3,000.00	.....	2,000.00
Placing pass trestles.....lump sum	.....	.....	5,000.00	.....	2,000.00
Cement .....barrels	2,000	2.50	5,000.00	2.50	5,000.00
Timber .....M. ft. B. M.	50,000	50.00	2,500.00	120.00	6,000.00
Lumber .....M. ft. B. M.	3,000	150.00	450.00	120.00	360.00
Piling .....lin. ft.	4,000	.90	3,600.00	1.00	4,000.00
Gages .....lin. ft.	5	5.00	25.00	5.00	25.00
Iron and steel .....pounds	400,000	.14	56,000.00	.13	52,000.00
Skilled labor .....hours	100	.75	75.00	.75	75.00
Unskilled labor .....hours	700	.30	210.00	.50	350.00
Total			$126,135.00		$101,385.00

Classification.	Approximate Quantities.	(3) J. C. Thomas, Louisa, Ky. Unit.	Total.	(4) Morris, Turner & Co. Roanoke, Va. Unit.	Total.
Excavation .....cu. yd.	1,500	$1.00	$ 1,500.00	$ 1.50	$ 2,250.00
Embankment .....cu. yd.	500	1.00	500.00	.50	250.00
Concrete .....cu. yd.	1,900	4.00	7,600.00	7.00	13,300.00
Riprap .....tons	1,000	2.00	2,000.00	2.00	2,000.00
Paving .....sq. yds.	700	3.00	2,100.00	3.00	2,100.00
Bolt holes .....lin. ft.	500	1.00	500.00	.75	375.00
Removal of weir sill.....lump sum	.....	.....	600.00	.....	3,500.00
Removal of lock gates.....lump sum	.....	.....	600.00	.....	500.00
Placing pass trestles.....lump sum	.....	.....	3,000.00	.....	1,000.00
Cement .....barrels	2,000	1.50	3,000.00	2.25	4,500.00
Timber .....M. ft. B. M.	50,000	100.00	5,000.00	60.00	3,000.00
Lumber .....M. ft. B. M.	3,000	100.00	300.00	140.00	420.00
Piling .....lin. ft.	4,000	.75	3,000.00	.50	2,000.00
Gages .....lin. ft.	5	4.00	20.00	10.00	50.00
Iron and steel .....pounds	400,000	.081	32,400.00	.15	60,000.00
Skilled labor .....hours	100	.50	50.00	.50	50.00
Unskilled labor .....hours	700	.30	210.00	.30	210.00
Total			$62,380.00		$95,505.00

Classification.	Approximate Quantities.	(5) Penn Bridge Co. Beaver Falls, Pa. Unit.	Total.
Excavation .....cu. yd.	1,500	$ .54	$ 810.00
Embankment .....cu. yd.	500	80	400.00
Concrete .....cu. yd.	1,900	7.45	14,155.00
Riprap .....tons	1,000	1.70	1,700.00
Paving .....sq. yds.	700	1.70	1,190.00
Bolt holes .....lin. ft.	500	.60	300.00
Removal of weir sill.....lump sum	.....	.....	940.00
Removal of lock gates.....lump sum	.....	.....	480.00
Placing pass trestles .....lump sum	.....	.....	5,500.00
Cement .....barrels	2,000	2.30	4,600.00
Timber .....M. ft. B. M.	50,000	60.00	3,000.00
Lumber .....M. ft. B M.	3,000	100.00	300.00
Piling .....lin. ft.	4,000	.40	1,600.00
Gages .....lin. ft.	5	3.50	17.50
Iron and steel.....pounds	400,000	.077	30,800.00
Skilled labor .....hours	100	.70	70.00
Unskilled labor .....hours	700	.60	420.00
Total			$66,282.50

BIDS FOR OHIO RIVER DAM.

Bids received by Capt. F. C. Boggs corps of engineers, U. S. army, Wheeling, W. Va., opened Jan. 25, for the construction of guide walls, etc., for dam 13, Ohio river, were as follows:

James Skene & Sons, St. Louis, Mo..$198,144
Hollarbach & May Contract Co., Evansville, Ind. 147,350
Fisher, Riley & Carozza, Baltimore, Md. 175,082

BIDS FOR U. S. S. PINTA.

The following bids for the purchase of the U. S. S. Pinta were received at the navy department, Washington, D. C., Feb. 19:

Max Silverstein, Oakland, Cal. $3,265.00
Olsen & Co., Vallejo, Cal. 555.00
William Peters, Oakland, Cal. 1,051.75

BIDS FOR NAVAL SUPPLIES.

Bids received at the bureau of supplies and accounts, navy department, Washington, D. C., on Feb. 18, for material and supplies for the navy yards, included the following:

Class 41—Washington, 50 Boat and Deck Clocks.
Chelsea Clock Co., 16 State St., Boston, Mass. .....$ 687.50

Class 42—Washington, 30 Spy Glasses.
Bausch & Lomb Optical Co., Rochester, New York .....$ 442.50
Price & Keen, 1211 Walnut St., Philadelphia, Pa. 444.00
Sussfield, Lorsch & Co., 37 Maiden Lane New York 526.50
Keuffel & Esser Co., Hoboken, N. J... 585.00

Class 43—Washington—50 Spy Glasses.
Bausch & Lomb Optical Co., Rochester, New York 420.00
Price & Keen, 1211 Walnut St., Philadelphia, Pa. 417.50
Sussfield, Lorsch & Co., 37 Maiden Lane New York 422.50
Keuffel & Esser Co., Hoboken, N. J.. 595.00

Class 45—Washington—100 Binoculars.
Bausch & Lomb Optical Co., Rochester, New York $2,350.00
Price & Keen, 1211 Walnut St., Philadelphia, Pa. 2,360.00
Sussfield, Lorsch & Co., 37 Maiden Lane New York 2,487.50

Class 46—Washington—20 Binoculars.
Bausch & Lomb Optical Co., Rochester, New York $1,060.00
E. Lietz Co., 620 Commerce St., San Francisco, Cal. 1,020.00
Sussfield, Lorsch & Co., 37 Maiden Lane New York 1,140.00

BIDS FOR U. S. S. CANONICUS.

The following bids for the purchase of the U. S. S. Canonicus were received at the navy department, Washington, D. C., Feb. 19:

Frank Samuel, Philadelphia, Pa.....$ 8,510.00
A. B. Roame, Portsmouth, Va..... 51.00
Charles G. Davis, Philadelphia, Pa..... 6,315.25
Joseph Faltermayer, Philadelphia, Pa.. 11,126.50
Thomas Butler & Co., Boston, Mass... 10,569.00
John H. Gregory, Perth Amboy, N. J.. 8,312.00

BIDS FOR FURNISHING BUOYS.

Bids received at the office of the inspector of the third lighthouse district, for furnishing one or more combination gas and whistling buoys for Ambrose and Gedney channels, New York, and Point Judith, R. I., were as follows:

	Each.
Safety Car Heating & Lighting Co., N. Y.	$4,270
Nelson Goodyear, New York.....	7,737
United States Marine Signal Co., N. Y.	5,062

DREDGING INLAND WATERWAY.

Lieut. Col. Dan C. Kingman, government engineer, Savannah, Ga., recently opened bids for dredging 30,000 cubic yards in Inland Waterway, between Savannah, Ga., and Beaufort, S. C. The Simons-Mayrant Co., Charleston, S. C., bid 23 cents per cubic yard, which was the only bid submitted. It was accepted.

CONSOLIDATED STEAMSHIP CO.

The receivers of the Consolidated Steamship Co., of the $60,000,000 Morse combine, have filed their preliminary report in the United States Circuit Court here. The report shows that the liabilities and assets are approximately about $120,252,930. Shortly after being appointed the report states that the receivers met in Boston and New York and made such investigation as was possible of the affairs of the company. It was learned that Messrs. Gunn, Richards & Co., well known New York accountants, had been employed by a committee acting under the agreement dated Dec. 28 and entitled "Bondholders." The assets and liabilities are as follows:

Assets: Cash in banks, $1,973; accounts receivable, $13,284; notes receivable, $192,000; office furniture, etc., $241; American Trust Co. trustee bonds held for future issue, $14,400. Investments par value of shares: Clyde Steamship Co., $13,214,800; Mallory Steamship Co., $13,723,400; New York & Cuban Mail Steamship Co., $19,393,600; New York & Porto Rico Steamship Co., $75,800,000; Metropolitan Steamship Co., $2,897,500; Eastern Steamship Co., $2,856,300; total $59,985,600. Book value, $119,971,200; organization expenses, $59,831; total, $120,252,930.

Liabilities: $58,578; accounts payable $195,000; bonds authorized and issued, $60,000,000; capital stock issued, $59,986,600; profits and loss $12,752; total, $120,252,930.

The Graphoil Lubricating Co., 49-61 Clymer street, Brooklyn, N. Y., has just issued a catalog descriptive of Graphoil lubricating specialties. The superior lubricating qualities of graphite have long been recognized. The Graphoil process is to feed graphite with each drop of oil. The Graphoil specialties comprise complete graphite and oil lubricators and graphite cups.

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PROPOSALS.

U. S. Engineer Office, 57 Park street, Grand Rapids, Mich., Feb. 24, 1908. Sealed proposals for extension and repair of south pier at Frankfort, Mich., will be received here until 3 P. M., March 25, 1908, and then publicly opened. Information furnished on application. M. B. Adams, Col. Engrs.

U. S. Engineer Office, Duluth, Minn., March 6, 1908. Sealed proposals for dredging and hire of dredging plant at Superior Entry, Wis., will be received here until noon Monday, April 6, 1908, and then publicly opened. Information on application. Graham D. Fitch, Major, Engrs.

PASSENGER BOAT WANTED

PASSENGER BOAT WANTED, length 75 to 80 ft., beam 17 to 18 ft., single deck. Give full description of hull, engine and boiler. We have a Steamer For Sale, or exchange, which is a little too large for our business. Address L. E. Eggert, Muskegon Heights, Mich.

SMALL STEAM BARGE WANTED

SMALL STEAM BARGE FOR sale, 126 ft. long, 26 ft. beam, 9 ft. 4 in. depth of hold. Engine 20 x 20 high pressure, Scotch boiler allowed 150 pounds of steam. Hull and machinery in first class condition. Capacity of lumber 250 M., 400 tons of coal. Address P. O. Box 804, Marine City, Mich.

STEAMERS FOR SALE.

FREIGHT AND PASSENGER steamer for sale, 500 gross tons. Allow 600 excursionists. Will sleep 75 night passengers. Address Box 123, THE MARINE REVIEW, Cleveland, O.

PASSENGER STEAMER "JOHN Haggart" For Sale cheap, Canadian Register. 105 ft. long, 17½ ft. beam, 5 ft. draught. In good condition, having been recently repaired. Price and terms on application to Capt. A. L. Carney, Sault Ste. Marie, Ont.

TUGS FOR SALE.

TUG FOR SALE, 40 FT. X 10 FT. beam, 3 ft. draught, engine 10 x 10, boiler 250 lbs. steam. This Tug is trunnelled, salted and coppered, cost $8,000. Price $1,500. Also one 50 x 15 ft. beam, 5 ft. draught, engine 15 x 15, 100 lbs. steam. Price $1,600. R. W. Herfurth Company, 39 Cortlandt St., New York, N. Y.

PASSENGER STEAMER GRANdon for sale, composite build 70 ft. long, 16½ ft. beam, compound engine, independent air pump. Boiler is new 1907, allows 207 lbs. steam. Equipment is very complete. Also one lighter 100 tons capacity, built of oak, three years old. For information address Henry Freyensee, Sandusky, Ohio.

HOISTING OUTFIT.

ONE COMPLETE PACKAGE freight hoisting outfit for sale, consisting of one double Trout Engine 10 x 12 cylinders, shafting, drums, etc., now in the Steamer Brazil. This equipment was used but very little and is in the best condition. For price correspond with the Wisconsin Transportation Company, Sheboygan, Wis.

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Worthington Duplex Air Pump & Jet Condenser 9" x 12" x 10".

D. C. Sturtevant Blower & Engine.

Two Scotch Boilers 12' x 12'.

Two Scotch Boilers 11' x 12'.

Two Scotch boilers 13½' x 12'.

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154 Nassau Street, New York.

DREDGE FOR SALE. TWO-YARD dipper dredge with two 115-yard scows all in good shape. For further particulars address Box 126, the MARINE REVIEW, Cleveland, Ohio.

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